Standardised Hierarchical Control Conceptual Modelling (HCCM) for Making Paper Cubes

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1. Making Paper Cubes

1.1. Model behaviour

For the first step in creating the conceptual model we will create diagrams for the behaviour of entities in the system. Figure 1 displays the standard components of HCCM entity behaviour diagrams. The diagrams for making paper cubes are given in Figures 2-7 and show how entites create other entities as, e.g., cutting tape creates tape pieces.

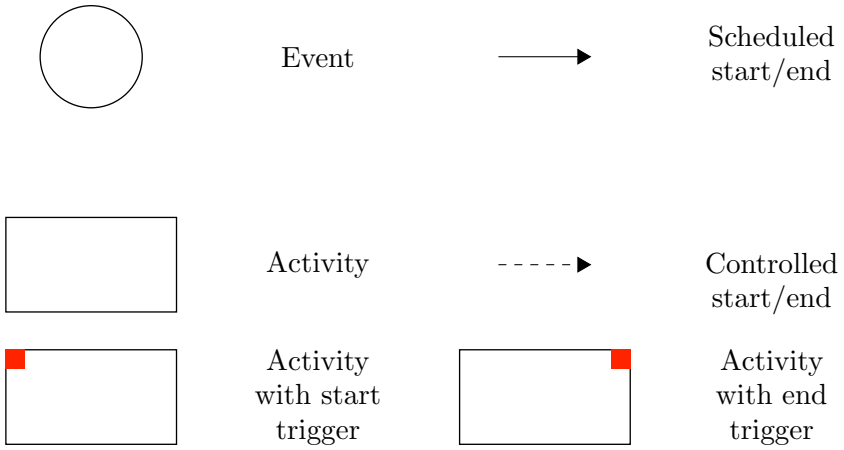

Figure 1.: Behaviour Diagram Key

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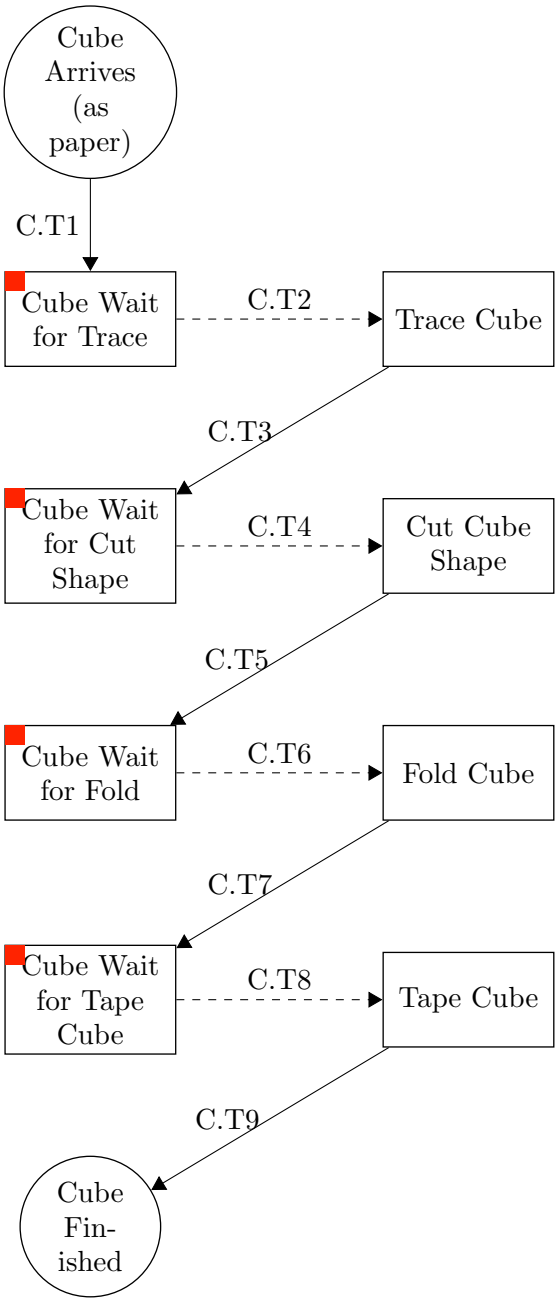

Figure 2.: Behaviour Diagrams – Cubes

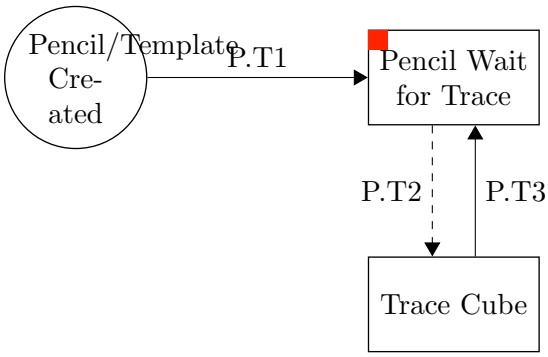

Figure 3.: Behaviour Diagrams – Pencil/Template

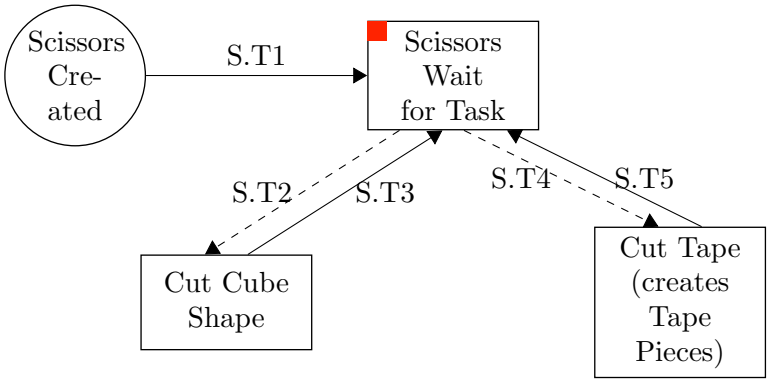

Figure 4.: Behaviour Diagrams – Scissors

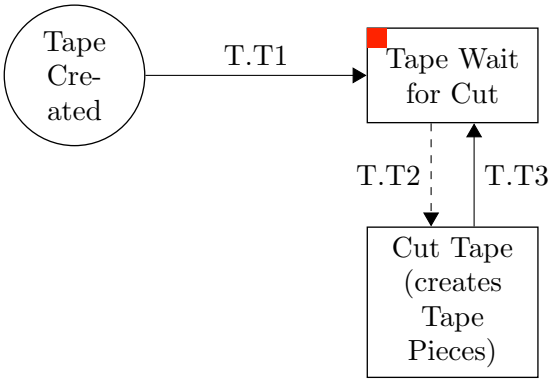

Figure 5.: Behaviour Diagrams – Tape

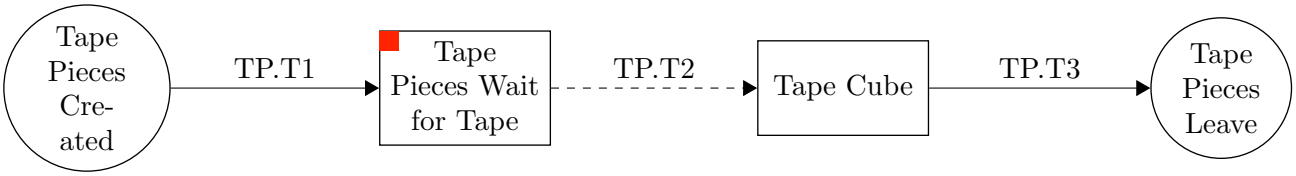

Figure 6.: Behaviour Diagrams – Tape Pieces

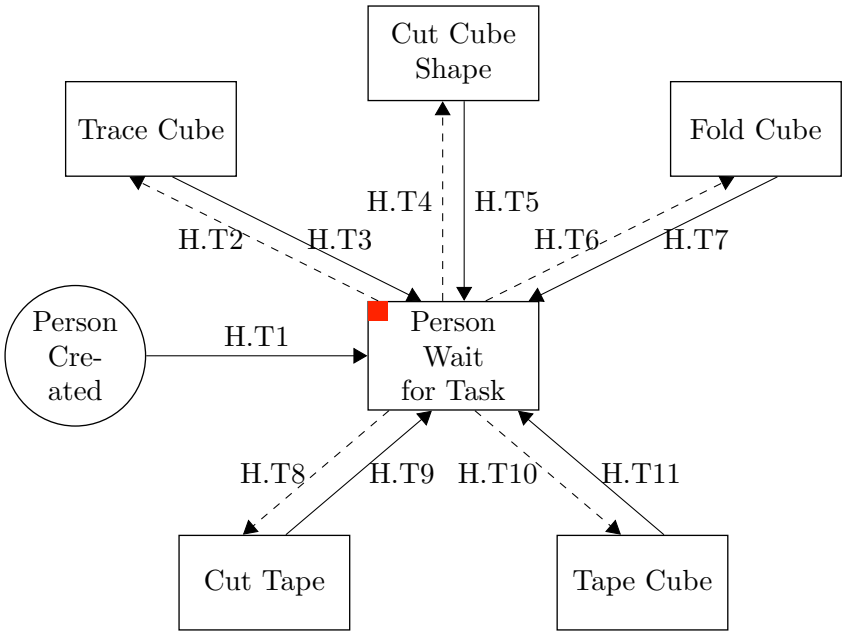

Figure 7.: Behaviour Diagrams – Person

1.2. Model logic

The unambiguous set of rules and strategies governing any conceptual model (CM) is an important step within their development process Furian, O'Sullivan, Walker, Vössner, and Neubacher (2015). Therefore, explicit and detailed logic is presented in this section.

Tables 1-9 are based on the fact that events trigger logic so that the logic names have either "on start" or "on end" followed by the name of the activity they represent.

Table 1: Definition of On Start Cube Wait for Trace.

Logic	
Logic Triggered	On Cube Wait for Trace.Start
Triggered By	Cube C
Pseudocode	

```
1:  if (any Pencil/Template P with P.CurrentAcivity = Pencil Wait for Trace) AND
2:     (any Person with H.CurrentActivity = Person Wait for Task)  then
3:         SELECT valid Pencil/Template P
4:         SELECT valid Person H
5:         Pencil Wait for Trace.End with P
6:         Person Wait for Task.End with H
7:         TRANSITION P.T2 from Pencil Wait for Trace.End to Trace Cube.Start
               with P
8:         TRANSITION H.T2 from Person Wait for Task.End to Trace Cube.Start
               with H
9:         Trace Cube.Start with P, H and C
10: end if
```

Table 2: Definition of On Start Cube Wait for Cut Shape.

Logic	
Logic Triggered	On Cube Wait for Cut Shape.Start
Triggered By	Cube C
Pseudocode	

```
1: if (any Scissors S with S.CurrentAcivity = Scissors Wait for Task) AND
2:    (any Person with H.CurrentActivity = Person Wait for Task)  then
3:        SELECT valid Scissors S
4:        SELECT valid Person H
5:        Scissors Wait for Task.End with S
6:        Person Wait for Task.End with H
7:        TRANSITION S.T2 from Scissors Wait for Task.End to
              Cut Cube Shape.Start with S
8:        TRANSITION H.T4 from Person Wait for Task.End to
              Cut Cube Shape.Start with H
9:        Cut Cube Shape.Start with S, H and C
10: end if
```

Table 3: Definition of On Start Cube Wait for Fold.

Logic	
Logic Triggered	On Cube Wait for Fold.Start
Triggered By	Cube C
Pseudocode	

```
1: if any Person with H.CurrentActivity = Person Wait for Task then
2:        SELECT valid Person H
3:        Person Wait for Task.End with H
4:        TRANSITION from H.T6 Person Wait for Task.End to Fold Cube.Start
              with H
5:        Fold Cube.Start with H and C
6: end if
```

Table 4: Definition of On Start Cube Wait for Tape Cube.

Logic	
Logic Triggered	On Cube Wait for Tape Cube.Start
Triggered By	Cube C
Pseudocode	

```
1: if (any Tape Pieces TP with TP.CurrentAcivity = Tape Pieces Wait for Tape)
2:    AND (any Person with H.CurrentActivity = Person Wait for Task)  then
3:        SELECT valid Tape Pieces TP
4:        SELECT valid Person H
5:        Tape Pieces Wait for Tape.End with TP
6:        Person Wait for Task.End with H
7:        TRANSITION TP.T2 from Tape Pieces Wait for Tape.End to
              Tape Cube.Start with TP
8:        TRANSITION H.T10 from Person Wait for Task.End to Tape Cube.Start
              with H
9:        Tape Cube.Start with TP, H and C
10: end if
```

Table 5: Definition of On Start Pencil Wait for Trace.

Logic	
Logic Triggered	On Pencil Wait for Trace.Start
Triggered By	Pencil P
Pseudocode	

```
1: if (any Cube C with C.CurrentAcivity = Cube Wait for Trace) AND
2:    (any Person with H.CurrentActivity = Person Wait for Task)  then
3:        SELECT valid Cube C
4:        SELECT valid Person H
5:        Cube Wait for Trace.End with C
6:        Person Wait for Task.End with H
7:        TRANSITION C.T2 from Cube Wait for Trace.End to Trace Cube.Start
              with C
8:        TRANSITION H.T2 from Person Wait for Task.End to Trace Cube.Start
              with H
9:        Trace Cube.Start with P, H and C
10: end if
```

Table 6: Definition of On Start Scissors Wait for Task.

Logic	
Logic Triggered	On Scissors Wait for Task.Start
Triggered By	Scissors S
Pseudocode	

```
1: if (any Cube C with C.CurrentAcivity = Cube Wait for Cut Shape) AND
2:    (any Person with H.CurrentActivity = Person Wait for Task)  then
3:        SELECT valid Cube C
4:        SELECT valid Person H
5:        Cube Wait for Cut Shape.End with C
6:        Person Wait for Task.End with H
7:        TRANSITION C.T4 from Cube Wait for Cut Shape.End to
              Cut Cube Shape.Start with C
8:        TRANSITION H.T4 from Person Wait for Task.End to
              Cut Cube Shape.Start with H
9:        Cut Cube Shape.Start with S, H and C
10: else if (any Tape T with T.CurrentAcivity = Tape Wait for Cut) AND
11:          (any Person with H.CurrentActivity = Person Wait for Task)  then
12:       SELECT valid Tape T
13:       SELECT valid Person H
14:       Tape Wait for Cut.End with T
15:       Person Wait for Task.End with H
16:       TRANSITION T.T2 from Tape Wait for Cut.End to Cut Tape.Start
              with T
17:       TRANSITION H.T8 from Person Wait for Task.End to Cut Tape.Start
              with H
18:       Cut Tape.Start with S, T and C
19: end if
```

Table 7: Definition of On Start Tape Wait for Cut.

Logic	
Logic Triggered	On Tape Wait for Cut.Start
Triggered By	Tape T
Pseudocode	

```
1: if (any Scissors S with S.CurrentActivity = Scissors Wait for Task) AND
2:    (any Person with H.CurrentActivity = Person Wait for Task)  then
3:        SELECT valid Scissors S
4:        SELECT valid Person H
5:        Scissors Wait for Task.End with S
6:        Person Wait for Task.End with H
7:        TRANSITION S.T4 from Scissors Wait for Task.End to
              Cut Tape.Start with S
8:        TRANSITION H.T8 from Person Wait for Task.End to
              Cut Tape.Start with H
9:        Cut Tape.Start with S, H and T
10: end if
```

Table 8: Definition of On Start Tape Pieces Wait for Tape.

Logic	
Logic Triggered	On Tape Pieces Wait for Tape.Start
Triggered By	Tape Pieces TP
Pseudocode	

```
1: if (any Cube C with C.CurrentAcivity = Cube Wait for Tape Cube) AND
2:    (any Person with H.CurrentActivity = Person Wait for Task)  then
3:        SELECT valid Cube C
4:        SELECT valid Person H
5:        Cube Wait for Tape Cube.End with C
6:        Person Wait for Task.End with H
7:        TRANSITION C.T8 from Cube Wait for Tape Cube.End to
              Tape Cube.Start with C
8:        TRANSITION H.T10 from Person Wait for Task.End to Tape Cube.Start
              with H
9:        Tape Cube.Start with TP, H and C
10: end if
```

Table 9: Definition of On Start Person Wait for Task.

Logic	
Logic Triggered	On Person Wait for Task.Start
Triggered By	Person P
Pseudocode	

```
    // Look for a Cube waiting
1:  if (any Cube C with C.CurrentActivity = Cube Wait for Trace) AND
2:     (any Pencil/Template P with P.CurrentActivity = Pencil Wait for Trace) then
3:         SELECT valid Cube C
4:         SELECT valid Pencil/Template P
5:         Cube Wait for Trace.End with C
6:         Pencil Wait for Trace.End with P
7:         TRANSITION C.T2 from Cube Wait for Trace.End to Trace Cube.Start
               with C
8:         TRANSITION P.T2 from Pencil Wait for Trace.End to Trace Cube.Start
               with P
9:         Trace Cube.Start with P, H and C
10: else if (any Cube C with C.CurrentActivity = Cube Wait for Cut Shape) AND
11:    (any Scissors S with S.CurrentActivity = Scissors Wait for Task) then
12:        SELECT valid Cube C
13:        SELECT valid Scissors S
14:        Cube Wait for Cut Shape.End with C
15:        Scissors Wait for Task.End with S
16:        TRANSITION C.T4 from Cube Wait for Cut Shape.End to
               Cut Cube Shape.Start with C
17:        TRANSITION S.T2 from Scissors Wait for Task.End to
               Cut Cube Shape.Start with S
18:        Cut Cube Shape.Start with S, H and C
```

Table 9: Definition of On Start Person Wait for Task(continued).

```
19: else if any Cube C with C.CurrentActivity = Cube Wait for Fold then
20:       SELECT valid Cube C
21:       Cube Wait for Fold.End with C
22:       TRANSITION C.T6 from Cube Wait for Fold.End to
                Fold Cube.Start with C
23:       Fold Cube.Start with H and C
24: else if (any Cube C with C.CurrentActivity = Cube Wait for Tape Cube) AND
25:         (any Scissors S with S.CurrentActivity = Scissors Wait for Task) AND
26:         (any Tape T with T.CurrentActivity = Tape Wait for Cut) AND
27:         (no Tape Pieces exist) then
28:       SELECT valid Tape T
29:       SELECT valid Scissors S
30:       Tape Wait for Cut.End with T
31:       Scissors Wait for Task.End with S
32:       TRANSITION T.T2 from Tape Wait for Cut.End to
                Cut Tape.Start with T
33:       TRANSITION S.T2 from Scissors Wait for Task.End to
                Cut Tape.Start with S
34:       Cut Tape.Start with S, H and T
35: else if (any Cube C with C.CurrentActivity = Cube Wait for Tape Cube) AND
36:         (any Tape Pieces TP with TP.CurrentActivity =
37:           Tape Pieces Wait for Tape then
38:       SELECT valid Cube C
39:       SELECT valid Tape Pieces TP
40:       Cube Wait for Tape Cube.End with C
41:       Tape Pieces Wait for Tape.End with TP
42:       TRANSITION C.T8 from Cube Wait for Tape Cube.End to
                Tape Cube.Start with C
43:       TRANSITION TP.T2 from Tape Pieces Wait for Tape.End to
                Tape Cube.Start with TP
44:       Tape Cube.Start with TP, H and C
45: end if
```

1.3. Model structure

This section uses the diagrams from Figures 2-5 to identify and define the HCCM elements (entities, events, and activities), and their possible relationships and combinations when creating an HCCM model for making paper cubes.

1.3.1. Entities

Table 10 captures the model entities and their attributes.

1.3.2. Activities

The next step of the HCCM standard implementation is the definition of the activities as in Table 11. Note that data sources – see Table 14 – are used throughout the activity definitions.

Table 10: Definition of entities

Structure	**Entities**	Cube	**Type**	Active
			Attributes – default value in []	ArrivalTime
				ID
				CurrentActivity [N/A]
				CurrentStart [N/A]
				WaitForTrace [0.0]
				WaitForCutShape [0.0]
				WaitForFold [0.0]
				WaitForTapeCube [0.0]
		Pencil/Template	**Type**	Active
			Attributes	ID
				CurrentActivity [N/A]
				CurrentStart [N/A]
				WaitForTrace [0.0]
		Scissors	**Type**	Active
			Attributes	ID
				CurrentActivity [N/A]
				CurrentStart [N/A]
				WaitForTask [0.0]
		Tape	**Type**	Active
			Attribute	ID
				CurrentActivity [N/A]
				CurrentStart [N/A]
				WaitForCut [0.0]
		Tape Pieces	**Type**	Active
			Attribute	ID
				CurrentActivity [N/A]
				CurrentStart [N/A]
				WaitForTape [0.0]
				ArrivalTime [0.0]
				LeavingTime [0.0]
		Person	**Type**	Active
			Attribute	ID
				CurrentActivity [N/A]
				CurrentStart [N/A]
				WaitForTask [0.0]

Table 11: Definition of activities.

Structure	**Activities**	Cube Wait for Trace	**Participants**		Cube (C)
			Start Event	**Type**	Scheduled
				State Change	1: (By default, omitted hereafter) C.CurrentActivity = this activity 2: (By default, omitted hereafter) C.CurrentStart = Current Time 3: TRIGGER On Start Cube Wait for Trace
			End Event	**Type**	Controlled
				State Changes	1: C.WaitForTrace = Current Time - C.CurrentStart *// TRANSITION (C.T2) is determined by logic*
		Trace Cube	**Participants**		Pencil/Template (P), Person (H), Cube (C)
			Start Event	**Type**	Controlled
				State Change	1: SCHEDULE End Event at Current Time + data source TraceCubeDuration(H)
			End Event	**Type**	Scheduled
				State Changes	1: TRANSITION (P.T3) from Trace Cube.End to Pencil Wait for Trace.Start with P 2: TRANSITION (H.T3) from Trace Cube.End to Person Wait for Task.Start with H 3: TRANSITION (C.T3) from Trace Cube.End to Cube Wait for Cut Shape.Start with C
		Cube Wait for Cut Shape	**Participants**		Cube (C)
			Start Event	**Type**	Scheduled
				State Change	1: TRIGGER On Start Cube Wait for Cut Shape
			End Event	**Type**	Controlled
				State Changes	1: C.WaitForCutShape = Current Time - C.CurrentStart *// TRANSITION (C.T4) is determined by logic*
		Cut Cube Shape	**Participants**		Scissors (S), Person (H), Cube (C)
			Start Event	**Type**	Controlled
				State Change	1: SCHEDULE End Event at Current Time + data source CutShapeDuration(H)
			End Event	**Type**	Scheduled
				State Changes	1: TRANSITION (S.T3) from Cut Cube Shape.End to Scissors Wait for Task.Start with S 2: TRANSITION (H.T5) from Cut Cube Shape.End to Person Wait for Task.Start with H 3: TRANSITION (C.T5) from Cut Cube Shape.End to Cube Wait for Cut Shape.Start with C
		Cube Wait for Fold	**Participants**		Cube (C)
			Start Event	**Type**	Scheduled
				State Change	1: TRIGGER On Start Cube Wait for Fold
			End Event	**Type**	Controlled
				State Changes	1: C.WaitForFold = Current Time - C.CurrentStart *// TRANSITION (C.T6) is determined by logic*

Table 11: Definition of activities (continued).

Fold Cube	**Participants**		Person (H), Cube (C)
	Start Event	**Type**	Controlled
		State Change	1: SCHEDULE End Event at Current Time + data source FoldDuration(H)
	End Event	**Type**	Scheduled
		State Changes	1: TRANSITION (H.T7) from Fold Cube.End to Person Wait for Task.Start with H 2: TRANSITION (C.T7) from Fold Cube.End to Cube Wait for Tape Cube.Start with C
Cube Wait for Tape Cube	**Participants**		Cube (C)
	Start Event	**Type**	Scheduled
		State Change	1: TRIGGER On Start Cube Wait for Tape Cube
	End Event	**Type**	Controlled
		State Changes	1: C.WaitForTapeCube = Current Time - C.CurrentStart *// TRANSITION (C.T8) is determined by logic*
Tape Cube	**Participants**		Tape Pieces (TP), Person (H), Cube (C)
	Start Event	**Type**	Controlled
		State Change	1: SCHEDULE End Event at Current Time + data source TapeDuration(H)
	End Event	**Type**	Scheduled
		State Changes	1: TRANSITION (TP.T3) from Tape Cube.End to Tape Pieces Leave with TP 2: TRANSITION (H.T11) from Tape Cube.End to Person Wait for Task.Start with H 3: TRANSITION (C.T9) from Fold Cube.End to Cube Cube Finished with C
Pencil Wait for Trace	**Participants**		Pencil/Template (P)
	Start Event	**Type**	Scheduled
		State Change	1: TRIGGER On Start Pencil Wait for Trace
	End Event	**Type**	Controlled
		State Changes	1: P.WaitForTrace = P.WaitForTrace + Current Time - P.CurrentStart *// TRANSITION (P.T2) is determined by logic*
Scissors Wait for Task	**Participants**		Scissors (S)
	Start Event	**Type**	Scheduled
		State Change	1: TRIGGER On Start Scissors Wait for Task
	End Event	**Type**	Controlled
		State Changes	1: S.WaitForTask = S.WaitForTask + Current Time - S.CurrentStart *// TRANSITION (S.T2 or S.T4) is determined by logic*

Table 11: Definition of activities (continued).

		Cut Tape	**Participants**		Scissors (S), Person (H), Tape (T)
			Start Event	**Type**	Controlled
				State Change	1: SCHEDULE End Event at Current Time + data source CutTapeDuration(H)
			End Event	**Type**	Scheduled
				State Changes	1: TRANSITION (S.T5) from Cut Tape.End to Scissors Wait for Task.Start with S 2: TRANSITION (H.T9) from Cut Tape.End to Person Wait for Task.Start with H 3: TRANSITION (T.T3) from Cut Tape.End to Tape Wait for Cut.Start with T 4: CREATE Tape Pieces TP 5: Initialise attributes ID, WaitForTape = 0.0, ArrivalTime = Current Time on TP 6: START Tape Pieces Created with TP
		Tape Wait for Cut	**Participants**		Tape (T)
			Start Event	**Type**	Scheduled
				State Change	1: TRIGGER On Start Tape Wait for Cut
			End Event	**Type**	Controlled
				State Changes	1: T.WaitForCut = T.WaitForCut + Current Time - T.CurrentStart *// TRANSITION (T.T2) is determined by logic*
		Tape Pieces Wait for Tape	**Participants**		Tape Pieces (TP)
			Start Event	**Type**	Scheduled
				State Change	1: TRIGGER On Start Tape Pieces Wait for Tape
			End Event	**Type**	Controlled
				State Changes	1: TP.WaitForTape = TP.WaitForTape + Current Time - TP.CurrentStart *// TRANSITION (TP.T2) is determined by logic*
		Person Wait for Task	**Participants**		Person (H)
			Start Event	**Type**	Scheduled
				State Change	1: TRIGGER On Start Person Wait for Task
			End Event	**Type**	Controlled
				State Changes	1: H.WaitForTask = H.WaitForTask + Current Time - H.CurrentStart *// TRANSITION (H.T2, H.T4, H.T6, H.T8 or H.T10) is determined by logic*

1.3.3. Events

Having presented the HCCM model's entities and activities, we now define the events in Table 12. There are no events within activities (Activities' start and end events are shown in Table 11) in this case study. Note that data sources – see Table 14 – are used throughout the event definitions.

1.3.4. Transitions

This part of the HCCM standard implementation shows the list of transitions in Table 13. Note that all transitions have unique names. These transitions are also indicated in the Figures 2-4.

Table 12: Definition of events.

Structure	**Events**	Simulation Start	**Participant**	None
			Type	Scheduled
			State Changes	1: **for** max number of cubes **do** 2: CREATE Cube C 3: Initialise attributes ArrivalTime = Current Time, ID, WaitForTrace = WaitForCutShape = WaitForFold = WaitForTapeCube = 0.0 on C 4: START Cube Arrives with C 5: **end for** 6: **for** each Pencil/Template, e.g., 1 **do** 7: CREATE Pencil/Template P 8: Initialise attributes ID, WaitForTrace = 0.0 on P 9: START Pencil/Template Created with P 10: **end for** 11: **for** each Scissors, e.g., 2 **do** 12: CREATE Scissors S 13: Initialise attributes ID, WaitForCut = 0.0 on S 14: START Scissors Created with S 15: **end for** 16: **for** each Tape, e.g., 2 **do** 17: CREATE Tape T 18: Initialise attributes ID, WaitForCut = 0.0 on T 19: START Tape Created with T 20: **end for** 21: **for** each Person, e.g., 4 **do** 22: CREATE Person P 23: Initialise attributes ID, WaitForTask = 0.0 on P 24: START Person Created with C 25: **end for**
		Cube Arrives	**Participant**	Cube (C)
			Type	Scheduled
			State Changes	1: TRANSITION (C.T1) to Cube Wait for Trace
		Cube Finished	**Participant**	Cube (C)
			Type	Scheduled
			State Change	1: Calculate statistics for C
		Pencil/Template Created	**Participant**	Pencil/Template (P)
			Type	Scheduled
			State Change	1: TRANSITION (P.T1) to Pencil Wait for Trace.Start
		Scissors Created	**Participant**	Scissors (S)
			Type	Scheduled
			State Change	1: TRANSITION (S.T1) to Scissors Wait For Task.Start
		Tape Created	**Participant**	Tape (T)
			Type	Scheduled
			State Change	1: TRANSITION (T.T1) to Tape Wait for Cut.Start
		Tape Pieces Created	**Participant**	Tape Pieces (TP)
			Type	Scheduled
			State Change	1: TRANSITION (TP.T1) to Tape Pieces Wait for Tape.Start
		Tape Pieces Leave	**Participant**	Tape Pieces (TP)
			Type	Scheduled
			State Change	1: Calculate statistics for TP
		Person Created	**Participant**	Person (P)
			Type	Scheduled
			State Change	1: TRANSITION (P.T1) to Person Wait for Task.Start
		Simulation Finish	**Participant**	None
			Type	Scheduled
			State Change	Calculate statistics as required, e.g., for Pencil/Template, Scissors, Tape, Person entities

Table 13: Definition of transitions.

Structure		
Transitions	**From Event**	**To Event**
C.T1	Cube Arrives	Cube Wait for Trace.Start
C.T2	Cube Wait for Trace.End	Trace Cube.Start
C.T3	Trace Cube.End	Cube Wait for Cut Shape.Start
C.T4	Cube Wait for Cut Shape.End	Cut Cube Shape.Start
C.T5	Cut Cube Shape.End	Cube Wait for Fold.Start
C.T6	Cube Wait for Fold.End	Fold Cube.Start
C.T7	Fold Cube.End	Cube Wait for Tape.Start
C.T8	Cube Wait for Tape.End	Tape Cube.Start
C.T9	Tape Cube.End	Cube Finished
P.T1	Pencil/Template Created	Pencil Wait for Trace.Start
P.T2	Pencil Wait for Trace.End	Trace Cube.Start
P.T3	Trace Cube.End	Pencil Wait for Trace.Start
S.T1	Scissors Created	Scissors Wait for Task.Start
S.T2	Scissors Wait for Task.End	Cut Cube Shape.Start
S.T3	Cut Cube Shape.End	Scissors Wait for Task.Start
S.T4	Scissors Wait for Task.End	Cut Tape.Start
S.T5	Cut Tape.End	Scissors Wait for Task.Start
T.T1	Tape Created	Tape Wait for Cut.Start
T.T2	Tape Wait for Cut.End	Cut Tape.Start
T.T3	Cut Tape.End	Tape Wait for Cut.Start
TP.T1	Tape Pieces Created	Tape Pieces Wait for Tape.Start
TP.T2	Tape Pieces Wait for Tape.End	Tape Cube.Start
TP.T3	Tape Cube.End	Tape Pieces Leave
H.T1	Person Created	Person Wait for Task.Start
H.T2	Person Wait for Task.End	Trace Cube.Start
H.T3	Trace Cube.End	Person Wait for Task.Start
H.T4	Person Wait for Task.End	Cut Cube Shape.Start
H.T5	Cut Cube Shape.End	Person Wait for Task.Start
H.T6	Person Wait for Task.End	Fold Cube.Start
H.T7	Fold Cube.End	Person Wait for Task.Start
H.T8	Person Wait for Task.End	Cut Tape.Start
H.T9	Cut Tape.End	Person Wait for Task.Start
H.T10	Person Wait for Task.End	Tape Cube.Start
H.T11	Tape Cube.End	Person Wait for Task.Start

Table 14: Definition of data sources

Data	Source	Identification	Input	Output
TraceCube Duration	Constant	Lookup	Person	Value via Lookup
CutShape Duration	Constant	Lookup	Person	Value via Lookup
FoldCube Duration	Constant	Lookup	Person	Value via Lookup
Tape Duration	Constant	Lookup	Person	Value via Lookup
CutTape Duration	Constant	Lookup	Person	Value via Lookup

1.3.5. Variables

There are no system variables for this model.

1.4. Model data

The data sources in Table 14 are need to be measured during initial cube making experiments.

References

Furian, N., O'Sullivan, M., Walker, C., Vössner, S., & Neubacher, D. (2015). A conceptual modeling framework for discrete event simulation using hierarchical control structures. *Simulation Modelling Practice and Theory*, *56*, 82 - 96. Retrieved from `http://www.sciencedirect.com/science/article/pii/S1569190X15000647`