INTRODUCING ITEMS IN A LIST

In order to introduce *items in a list*, a sentence must meet two requirements. First, the sentence needs to have a superordinate term, which **links forward** and **describes** the 'class of things' to which the listed items belong. It is also important to decide on whether these items form a **'closed'** or an **'open'** set, as this determines the structure and punctuation used to introduce these listed items.

1. CLOSED SET

When the listed items comprise a **closed set** (i.e., the only items in that 'class of things'), use Strategy 1.1 or 1.2.

1.1 Closed set: Number + superordinate + colon [:] + *list of items*

A master's thesis can typically be divided into **five chapters:** *an introduction, literature review, methods, results* **and** *conclusion*.

1.2 Closed set: Superordinate + the verb **to consist of** + *list of items*

The decision **variables** for optimization **consisted of** *temperature, volumetric flow* **and** *emission rate*.

2. OPEN SET

However, if the listed items form an **open set** (i.e., examples of some items that could be included in that group), then use Strategies 2.1-2.3.

2.1 Open set: Superordinate + **such as** + [*examples*]

Today's mobile lifestyle would not be possible without **vehicles, such as** *automobiles, buses, trams* **and** *aircraft*.

2.2 Open set: INDEFINITE QUANTIFIER + superordinate + **including** + [*examples*]

A new energy tax will be levied on **MANY** motorised **vehicles, including** *automobiles, lorries* **and** *motorcycles*.

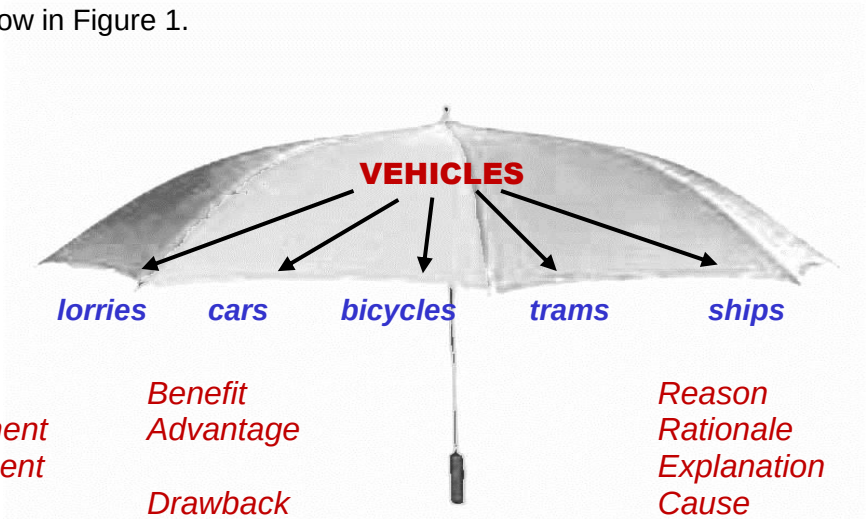
2.3 Open set: Superordinate + the verb **to include** + [*examples*]

The decision **variables** for optimization **included** *temperature, volumetric flow* **and** *emission rate*.

Superordinate Terms

Similar to closed lists, open lists require a **superordinate term** to introduce the example items in the list. Since identifying the correct superordinate can take some effort, most of the above problems can be attributed to either weak language skills, unfamiliarity with the vocabulary of the field, or simply laziness on the part of the writer. Superordinate terms (often also called *hypernyms, anaphoric nouns,* or *discourse-organizing words*) are nouns that can be used to stand for an entire **class** or **category** of things. Thus, a superordinate term acts as an **umbrella term** that includes within it the meaning of other words. For example, *vehicle* is the superordinate concept for *lorry*, *automobile*, *bicycle*, and *tram*.

Superordinate terms play an important role in promoting **cohesion** by providing writers with a more explicit means than would be possible using only pronouns (*it, they, this, these, those*) for linking their ideas either back to earlier presented text, or forward to upcoming information. Superordinates tell the reader what to expect when they occur before an idea. In this function, superordinate terms serve as the *class* in **definitions**, describe the *items* and *examples* presented in **lists**, and are important in creating **topic sentences** (See Appendix 5). The most common superordinates used in engineering are listed below in Figure 1.



Part	*Benefit*		*Reason*	*Class*
Component	*Advantage*		*Rationale*	*Category*
Constituent			*Explanation*	*Group*
Item	*Drawback*		*Cause*	*Division*
	Problem	*Approach*	*Influence*	*Set*
Criterion	*Issue*	*Technique*	*Motivation*	*Type*
Principle	*Disadvantage*	*Method*		*Form*
Idea	*Weakness*	*Strategy*	*Effect*	
Concept	*Challenge*	*Technology*	*Result*	*Option*
Notion	*Difficulty*	*Procedure*	*Outcome*	*Alternative*
	Limitation	*Process*	*Finding*	*Possibility*
Factor	*Constraint*	*Protocol*	*Response*	
Element	*Requirement*		*Consequence*	*Example*
Feature		*Solution*		*Instance*
Aspect		*Answer*	*Subject*	*Occurrence*
Facet	*Similarity*		*Topic*	*Case*
Quality	*Difference*	*Phase*	*Area*	*Scenario*
Property	*Distinction*	*Stage*		*Situation*
Characteristic		*Step*		

Figure 1: Common superordinate terms used in engineering, grouped according to functional areas.

1. Closed-Set Lists

When describing or analyzing concepts for a literature review or a theory chapter, you will often need to either divide a concept into its **components** or classify previous solutions into **categories** based on criteria relevant to the aims of your research, since complex subjects are more easily understood when broken down into smaller groups. For this purpose, engineering texts tend to use a **classification-division** organizational pattern, which first introduces the categories or sub-classes of the concept as either a formatted or unformatted list, and then describes each category in greater detail, preferably in the same order as presented in the introductory list. **Formatted lists** are those that present the items as a vertical list using either bullets [•], numbers [1. , 2. , 3. ,…] or letters [a., b., c.,..], whereas **unformatted lists** present the listed items as a horizontal list.

1.1 Introducing a closed set using a colon [:]

Although an **Em dash [—]** or a **comma [,]** are widely used in the fields of **art**, **business** and the **humanities** for introducing items in a list, avoid using these in science and engineering. In science and engineering, a **closed set** of items is typically introduced with a colon [:] using the following structure and vocabulary (Figure 2):

[TOPIC]	**has been** ***can be**	**divided** **classified** **categorized** **grouped**	**into**	[HOW MANY?] **the following**	**subdivisions:** **classes:** **groups:**	[item$_1$]**,** [item$_2$]**, and** [item$_3$].

Using *can* indicates that this is the writer's own interpretation, whereas the **present perfect tense** (i.e., ***has been) shows that the classification is widely accepted among the scientific community.

Figure 2: Typical sentence structure and vocabulary for presenting a closed set using a colon [:].

In order to use a colon [:], the text before the colon must contain three essential components:

1) A grammatically **complete sentence** before the colon [:]
2) A qualifier, either (a) a **numerical quantity** announcing the number of items in the list, or (b) the expression *the following*
3) A superordinate term that identifies the category to which the listed items belong

As shown in Figure 3, even the presentation of equations, when only one item is listed, requires a complete sentence, a qualifier (*the following*) and a superordinate term (*equation*) in order to use a colon [:]. In the example without a colon (right pane), note that a colon [:] cannot be used, since the text before the equation does not form a complete sentence. Instead, the equation is integrated into the sentence and therefore requires a comma [**,**] after the equation and a period [**.**] at the end.

The increased spectral efficiency of the system can be represented by **the following** equation**:** $$a = \frac{d_i(t)}{d_i^-}$$	The effective bulk-like second-order susceptibility of TMDs is obtained from the sheet susceptibilities as $$\left|\chi_{\text{eff}}^{(n)}\right| = \frac{\left|\chi_s^{(n)}\right|}{t},$$ where t is the thickness of the TMD monolayer, ~0.65 nm**.**

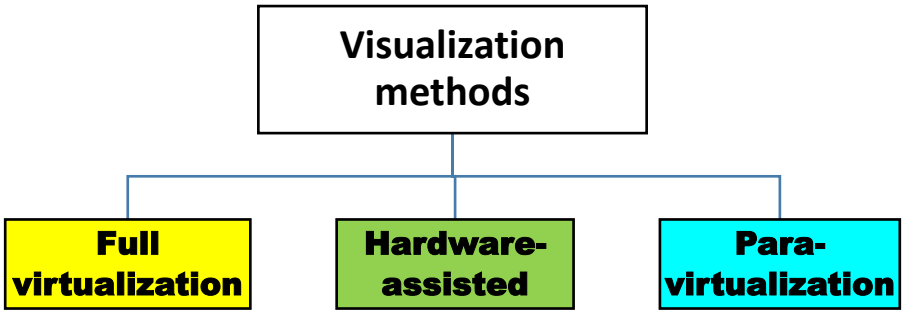
Figure 3: Presentation of an equation ***with*** (left pane) and ***without*** (right pane) a **colon [:]**.

In Figure 4 below, note that the text before the colon [:] meets all three of the requirements for using a colon: (1) It expresses a **complete sentence**. In othe words, it has a **subject** (*This study*), a **verb** (*has*) and a **compliment** (*three goals*); (2) it also announces the **number** of items in the list; and (3) the text before the colon uses a **superordinate term** (*goals*) that answers the question *'What are these items?'*.

UNFORMATTED LISTS	**FORMATTED LISTS**
Option 1 (Single sentence, colon, commas) This study has **three goals: To identify** the stages in the pavement management process, **to determine** the factors leading to the evolution of application user interfaces, **and to evaluate** the implementation of these user interfaces in a case study.	**Option 2** (topic sentence, colon, no commas) This study has **three goals:** 1) **To identify** the stages in the pavement management process 2) **To determine** the factors leading to the evolution of application user interfaces 3) **To evaluate** the implementation of these user interfaces in a case study

Figure 4: The same closed set of items presented with a colon as an *unformatted* and *formatted* list.

In engineering, closed-set lists are often used as topic sentences (Appendix 5) that first **preview** the items and then afterwards discuss them in the **same order** as they appeared in the list. Therefore, it is also important to strategically order these items **least relevant → most relevant** in terms of your topic, as shown below in Figure 5.



[1]Virtualization can be implemented using three methods**: full virtualization**, **hardware-assisted virtualization**, **and paravirtualization** [15].

[2]In full virtualization,… [3]Full virtualization provides ...

[4]Hardware-assisted virtualization enables...
[5]However, hardware -assisted virtualization cannot…

[6]Finally, paravirtualization offers the most effective...
[7]Another advantage of paravirtualization is that…
[8]In this thesis, paravirtualization will therefore be used to…

Figure 5: Strategic ordering of items in a list to allow placement of the most relevant or important item at the end of the list, where it can discussed at greater length and further divided into subtopics.

1.2 Introducing a closed-set without a colon

As can be seen from Figure 6, Options 3 and 4 both formulate the list as a single sentence. When "packing" a list into a single sentence, always use a **comma** [,] to separate each item in the list, remember to add **the word and** *before* the last item in the list, and end the list with a **full stop** (UK)/ a **period** (USA). However, note that no colon [:] can be used before the list, since the text introducing the list (i.e., "*This study aims to"*) does not form a complete sentence, nor does it have a superordinate.

UNFORMATTED LISTS	**FORMATTED LISTS**
Option 3 (single sentence) This study aims **to identify** the stages in the pavement management process**, to determine** the factors leading to the evolution of application user interfaces**, and to evaluate** the implementation of these user interfaces in a case study**.**	**Option 4** (single sentence integrating a bulleted list) This study aims ▪ **to identify** the stages in the pavement management process**,** ▪ **to determine** the factors leading to the evolution of application user interfaces**, and** ▪ **to evaluate** the implementation of these user interfaces in a case study**.**

Figure 6: The same closed set of items presented without a colon as an *unformatted* and *formatted* list.

The above examples illustrate the use of a colon to introduce items of the same status; in this case, the aims of a study. However, as mentioned earlier, another function of lists is to divide an entity into its parts, or to classify items into groups. This function is commonly referred to as **classification-division**. When using this pattern, inexperienced writers often over-rely on the use of the weak verb *to be* to describe the relationship between the parts and the whole. However, academic writing avoids using the verb *to be* in such cases. Figure 6 presents a list of the most common verbs used to replace the verb *to be* when introducing a closed set of items in a list (See Verbs to replace weak verbs).

WRONG:

The decision **variables** for optimization **are** *temperature*, *volumetric flow,* **and** *emission rate*.

BETTER:

The decision **variables** for optimization **consist of** *temperature*, *volumetric flow,* **and** *emission rate*.

DIVISION (WHOLE→PARTS)

The proposed system	**consists of** **is composed of** **is comprised of** (USA) **comprises** (UK) ***is made up of**	an accelerometer, tilt sensor and gyroscope.

*Informal spoken form

Figure 6: Verbs commonly used to replace the verb *to be* when introducing a closed set of components.

Punctuation for separating items in a list

To separate items in a list, commas [,] are usually sufficient for making clear the divisions between each item, as shown in Figure 6. However, what should the writer do when at least one of the items already contains a comma [,]? In such cases, the only option for the writer is to replace all of the separating commas with **semicolons [;]** in order to avoid potential confusion. This use of semicolons [;] for dividing items in a list is shown in Figure 7. Note how the commas [,] in a single item *'repair and replacement of heating, ventilation, and air conditioning systems'* forces the writer to replace the dividing punctuation with a semicolon [;].

UNFORMATTED LIST	**FORMATTED LIST**
The tasks implemented during the renovation project include renovation of student and staff restrooms; replacement of aging electrical and plumbing systems; **repair and replacement of heating, ventilation, and air conditioning systems;** installation of solar panels; **and** upgrading access for the disabled**.**	The tasks implemented during the renovation project include ▪ renovation of student and staff restrooms**;** ▪ replacement of aging electrical and plumbing systems**;** ▪ **repair and replacement of heating, ventilation, and air conditioning systems;** ▪ installation of solar panels**; and** ▪ upgrading access for the disabled**.**

Figure 7: *Unformatted* and *formatted* lists using semicolons [;] to avoid confusion when one or more of the items contain a comma [,].

Use parallel grammatical forms

Another important feature of lists is that the items should always be presented using the same parallel grammatical form. In other words, if you begin the first item in the list with an **infinitive verb** (*to renovate*) or **noun** (*-tion, -ment, -ing*), then all the items must use the same form.

WRONG:

The tasks implemented during the renovation project include

noun — 1. **renovation of** student and staff restrooms**;**
imperative — 2. **replace** aging electrical and plumbing systems**;**
infinitive — 3. **to repair** and **replace** heating**,** ventilation**,** and air conditioning systems**;**
noun — 4. **installation of** solar panels**;** and
sentence — 5. **access** for the disabled will be upgraded**.**

BETTER:

The tasks implemented during the renovation project include

- **renovation of** student and staff restrooms**;**
- **replacement of** aging electrical and plumbing systems**;**
- **reparation** and **replacement of** heating**,** ventilation**,** and air conditioning systems**;**
- **installation of** solar panels**;** and
- **upgrading** access for the disabled**.**

Note that the left-hand formatted list is ineffective because it uses four different grammatical forms (i.e., noun, verb, infinitive, sentence), whereas the effective right-hand list uses the same parallel structure (i.e., noun phrase) for all numbered items in the list.

2. Open-Set Lists

Unlike a closed set of items, an **open set** suggests that more items could be added to the list than have already been stated. Closed sets are used to present **examples** to help the reader in understanding the concept or, in the case of a master's thesis, to demonstrate the depth of your understanding that concept. For this function, science has developed different language strategies for signaling that the ensuing information will provide examples. Table 1 shows some of the most common mistakes and how to correct them. Note that similar to structures used for introducing a closed set, presenting an open set of examples also requires a superordinate term that describes the class of things to which the listed items belong.

Table 1: Common problems when introducing examples (i.e., open set of items) and strategies to overcome them.

Poor (no superordinate)	**Better** (with superordinate)
…, etc. These processes have employed *acid hydrolysis, chlorination, alkaline extraction*, **etc**.	**2.1 Superordinate** + **such as** + [*examples*] These processes have employed **common chemical procedures, such as** *acid hydrolysis, chlorination*, **and** *alkaline extraction*. **2.2 QUANTIFIER** + **superordinate** + **including** + [*examples*] These processes have employed **VARIOUS common chemical procedures, including** *acid hydrolysis, chlorination*, **and** *alkaline extraction*. **2.3 Superordinate** + the verb **to include** + [*examples*] **Common chemical procedures** employed in these processes **include** *acid hydrolysis, chlorination*, **and** *alkaline extraction*.
…, for example, … **…, among others,..** **…, e.g., …** A major challenge of utilizing, **e.g.** *natural fibers*, for composite applications is their extremely hydrophilic nature.	**2.1 Superordinate** + **such as** + [*examples*] A major challenge of utilizing **cellulosic materials, such as** *natural fibers*, for composite applications is their extremely hydrophilic nature. **Superordinate (e.g.,** + *examples***)** A major challenge of utilizing **cellulosic materials (e.g.,** *natural fibers***)** for composite applications is their extremely hydrophilic nature.
…are … **…are, for example, …** **…are, among others, …** **…are, e.g., …** The **potential benefits** of biodegradable films **are** *food protection, preservation,* and *enhancing food appearance*.	**2.1 Superordinate** + **such as** + [*examples*] Biodegradable films offer **potential benefits, such as** *food protection, preservation*, **and** *enhancing food appearance*. **2.2 QUANTIFIER** + **superordinate** + **including** + [*examples*] Biodegradable films offer **MANY potential benefits, including** *food protection, preservation*, **and** *enhancing food appearance*. **2.3 Superordinate** + the verb **to include** + [*examples*] The **potential benefits** of biodegradable films **include** *food protection, preservation*, **and** *enhancing food appearance*.