

# INFO90002 2022 Semester 1 - ASSIGNMENT 1

**Weighting:** 20% of your total assessment (5% Conceptual Model, 15% E-R Model)

**Group Assessment:** Groups of four (4) students from the same tute

**Assignment deadline:** Check Canvas

**Assignment submission:** Canvas

## CASE STUDY: The StarAir Airline

StarAir is an international airline flying several types of aircraft made by Boeing and Airbus. The airline has concerns that their IT system needs improvements so the Board of Directors decided to start with an updated model for the future database.

The company needs to keep track of their fleet of aircraft and the airports they fly to and from.

StarAir needs to know the **manufacturer specifications of each aircraft, i.e. its model (e.g. A350-900, 787-9), manufacturer/supplier (Airbus, Boeing), aircraft length, its wingspan, minimum required runway length and maximum seat capacity.** They also need to keep track of suppliers for each aircraft model, e.g. for an A350-900 the supplier is Airbus. Supplier details need to include the **company name, contact person name and their phone number.** Note, StarAir buys only new aircrafts, so a manufacturer is also a supplier.

Every **aircraft gets a unique registration number** (also called tail number), as per Convention on International Civil Aviation requirements<sup>1</sup>.

Every airline decides on the number of seats for each plane it buys so StarAir needs to record **economy, premium economy and business** cabin seat capacity for each airplane as determined by StarAir. Note, due to modern business seats, the planes do not have first class cabin.

The following data about airports needs to be stored: **airport code** (these are internationally adopted codes, e.g. MEL for Melbourne Tullamarine, SYD for Sydney Kingsford Smith, LHR for London Heathrow, LCY for London City airport, etc.), **airport name, location** (city or region, state if applicable, country), **airport departure tax and airport landing tax** (in the currency that is charged by the airport), which **airplane models can land at that airport based on runway requirements.**

So for each aircraft the StarAir operations department needs to know at which airports it can land. For example, many smaller airports cannot accommodate an A380.

StarAir also wants to record routes they are flying (**route code, local or international, departure airport, destination airport**), and **legs that make up this route.**

Some routes contain 2-3 flight legs. For example, the Melbourne-London route consists of 2 legs – Melbourne to Bangkok, then Bangkok to London Heathrow. **Each leg is a route in itself.**

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<sup>1</sup> There are some rules on registration codes based on country or region but these details are largely not relevant for this assignment. For those who want to see more details, see [https://en.wikipedia.org/wiki/List\\_of\\_aircraft\\_registration\\_prefixes](https://en.wikipedia.org/wiki/List_of_aircraft_registration_prefixes)

A leg is described by departure airport, destination airport, length in miles and expected flight duration.

Each leg has multiple flights associated with it, i.e. on any given day none, one or more flights can be flying this leg. For example, StarAir flight ST212 (operated by Boeing 777-300ER) departs Sydney to Singapore at 9:20 every day of the week, flight ST222 (operated by Airbus A380-800) departs Sydney to Singapore at 16:10 Tuesday, Thursday, Saturday and Sunday.

For flight details, the airline wants to record the flight code (e.g. ST212, ST14 and similar), day of the week and scheduled departure time for that day, expected arrival time and default aircraft type. As explained in the previous paragraph, a flight can operate on multiple days of the week, only once per day but on different days of the week it could be different departure times.

For every flight instance, StarAir needs to store date of the flight, allocated aircraft, and allocated crew members (more details on crew employees are provided later in the case study).

Each route has a number of booking classes<sup>2</sup> (as travel professionals call them) associated with it. A booking class has fare code, fare rules, and commission in % payable to travel agents for selling the flights in this fare category. The table below lists examples of booking classes as used by StarAir.

Fare code	Class	Rules	Commission rate %
D	Business	Changes – unlimited no charge, cancellation fee -\$100	10
C	Business	Changes – unlimited, first change - no charge, every next change - \$250, cancellation fee -\$500	10
J	Business	Non-refundable, changes - \$250 each	7
Y	Economy	Changes – unlimited, first change - no charge, every next change - \$150, cancellation fee -\$100	10
B	Economy	Changes – unlimited, first change - no charge, every next change - \$150, cancellation fee -\$100	10
M	Economy	Non-refundable, changes after departure not allowed; changes before departure - \$400	5
W	Economy	Non-refundable, no changes	5

For each flight StarAir allocates a specific number of seats to each booking class (this is based on some complex formula that takes into consideration high/low season, what types of aircrafts fly this route, passengers' preference for comfort or lower price, etc.; this is *not relevant* to this preliminary design). For example, an A350-900 has 40 Business class and 263 Economy class seats. On a flight Sydney to Singapore, 14 seats will be D fare code at \$4000,

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<sup>2</sup> Booking class is NOT what passengers call business class or economy class, etc. Booking class is a category of seats with associated set of rules (e.g. cancellation, changes) and price. The booking class is represented by a letter. That is how airlines know how many seats have been allocated to a certain price and how many in this booking class have not been sold. These booking classes also determine how frequent flyer points are calculated. For those who want to read more, see [https://en.wikipedia.org/wiki/Fare\\_basis\\_code](https://en.wikipedia.org/wiki/Fare_basis_code)

24 seats – C fare code at \$3700, and 10 seats J fare code at \$3200 (note that seats represent tickets, not physical seats and that the total is not equal to 40 physical seats in business cabin of A350-900 as airlines oversell seats).

The company keeps track of employees but for the purpose of this phase, they only want to keep track of the flying crew. So for each employee they need to store **employee ID, first name, last name, phone number, employment type, and types of aircrafts this employee was trained to work on**. Employment type means position (e.g. flight attendant, senior flight attendant, pilot, co-pilot) and annual salary.

Each flight instance gets crew members allocated to it, i.e. pilots, co-pilots, flight attendants. StarAir needs to keep track which employee worked on which flight instance.

**TASK:** Your group has been asked to provide:

**I)** A Conceptual model of the StarAir case study in Chen notation. In conceptual design surrogate keys can be added to strong entities only. Weak entities must have PFKs.

**II)** A physical Entity Relationship model using Crows Foot notation suitable for a MySQL relational database version 8.0 or higher. The physical E-R model should be based on your Chen conceptual model.

**III)** A copy of your final workbench file (format .mwb).

## Assignment Submission:

**ONE GROUP MEMBER** should submit the assignment via the CANVAS LMS

<https://lms.unimelb.edu.au>

**ONE PDF** document named as your Group number id (e.g. Wed10-1.pdf) **on or before the deadline**, containing:

- Legible image of your Conceptual Model in Chen notation
- Legible image of your Physical ER Model in Crows foot notation
- Assumptions (maximum 100 words) – your models should speak for themselves.
- Work break down per team member (measured 1-100% per team member)
- Student name and Student Number of all the students in your group

**N.B.** If you fail to submit legible models you will be penalised 10% of your total grade for this assignment.

**ONE COPY** of your team's final MySQL Workbench modelling file (with an .mwb extension) of the Physical ER model **on or before the deadline**.

## Late Submissions

Assignments that are late without a formal granted deadline extension from the subject coordinator will attract a penalty of 10% for **each Academic Day** as per the School of Computing and Information Systems policy.

## Subject Hurdle

To pass INFO90002 you must pass two hurdles. First you must obtain a mark of 25/50 or higher for the two assignments and two quizzes **AND** obtain a mark of 25/50 or higher for the end of semester assessment (exam).

## Frequently Asked Questions

1. Do all images and links need to be stored in the database? A: YES. As a database designer you are required to store every attribute you think is required *inside the database*.
2. How do I submit a high resolution image of our conceptual and physical design? A: We recommend using an A3 page size in MySQL Workbench and exporting the image as a PDF
3. How do I join my multiple different documents together? A: Save all your documents as PDFs and then merge each PDF into a master document. Another method is to upload all documents to a single Google doc and then download as a single PDF
4. How do I make MySQL workbench show PFK's (Primary Foreign Keys) A: Please refer to the modules section in the LMS. Scroll down to **Resources**. You will find the file **db.Column.pkfk.11x11.png** and a pdf of instructions for both Mac and Windows.

## Group Work Advice

Industry expects our Master graduates to be able to work and communicate effectively in teams. This is why the University includes group work assessment in the majority of graduate classes.

When you form your team *immediately* decide the following:

1. How you will communicate to each other?
2. How often you will communicate?
3. How often you will meet as a group?
4. Agree on a communication escalation path  
E.G. WhatsApp – then if no response, SMS then if no response, email then if no response phone call, then if no response speak to the Subject Coordinator
5. Work out each team member's strengths and weaknesses. Assign tasks based on strengths.
6. Agree on a timetable or Gantt chart of tasks and deadline dates.
7. Pick someone to be the team leader/coordinator of your team. They will have responsibility to do their own work and follow up with other team members to make sure they are doing theirs.
8. Although unlikely, work out how you will break a deadlock before you need to break a deadlock.
9. Teams from a variety of cultural, age, gender, socio-economic and educational backgrounds do better than homogenous teams. Mix it up to avoid group think and the same cognitive biases in team members.
10. Team Problems? Escalate to the Subject Coordinator EARLY so it doesn't mean anger, tears and regret later.
11. Failure to plan is a plan to fail. Don't fail. PLAN.

**GOOD LUCK!**

## Example Rubrics – Physical E.R. Model

	COMPLEXITY TEST	SIMPLICITY TEST	DATA TYPES	ENTITIES	ATTRIBUTES
Looking at the model make an assessment about the attempt. This includes attribute & entity names. Over reliance on default values. Relationships and Relationship labels. Appropriate suitable PK choices.	<p>5. No unnecessary or superfluous relationships. Efficient design that is normalised with focus on efficient and effective implementation of the case study. Very good relationship labels. Nothing beyond 3NF</p> <p>4. <b>Not overly complex. Entity count is reasonable. Relationship Labels make sense.</b></p> <p>3. Somewhat complex; Some excessive use of attributes; Modelled beyond the case study; A few superfluous entities, relationships, attributes</p> <p>2. General impression is of over engineered solution going well beyond the reasonable scope of the case study. Every attribute that could be a lookup table (e.g. Suburb, Country) is a lookup table</p> <p>1. Excessively overengineered, more representative of a model about to become an instance than the first cut of the clear text case study. Too many entities, too many attributes and relationships.</p> <p>0. Excessively complex; excessive entities excessive attributes and relationships; Modelled the real world not to the case study; Plagiarism <b>(COMMENT)</b></p>	<p>5. Not overly simplified. Very good normalisation. Efficient design that is normalised with a focus on effective and efficient performance</p> <p>4. A good model. Some minor issues with normalisation. Mostly efficient and practical design, with perhaps a focus on the model's eventual implementation rather than the clear text case study. Better than below, Not as good as above.</p> <p>3. <b>Some denormalisation. Some reliance of default data types (e.g. varchar 45). A few missing key entities &amp; attributes. Some use of assumptions to solve issues.</b></p> <p>2. Over reliance on weak entities and surrogate keys. Focus is on query performance not modelling design</p> <p>1. Overly denormalised; Too simplified; Missing relationships; Missing key entities &amp; attributes. Over reliance on assumptions.</p> <p>0. Plagiarism</p>	<p>4. The choice of data type has been considered for every attribute in the model and suitable for the context of the case study</p> <p><b>3. Most data types have been considered but there are some errors and inconsistencies</b></p> <p>2. ALL data types are default (INT for PK, VARCHAR(45) for strings - or other default (e.g varchar(40))</p> <p>1. Mismatch in PK-FK data type; Poor data type choices in more than half of the entities</p> <p>0. Complete misunderstanding of datatype use. Plagiarism <b>(COMMENT)</b></p>	<p>8. An excellent map of entities that models the case study. Entity names are sensible (not too long, abbreviated names are understood)</p> <p>7. A very good map of entities that models the case study; Minor issues with entity choices, naming, relationship normalisation logic. 1-3 minor issues with missing OR/AND superfluous entities</p> <p><b>6 A good map of entities that models the case study. Some issues with entity choice, naming, relationship, minor denormalisation; More than 3 A few superfluous entities OR/AND few missing entities;</b></p> <p>5. Entity count is too few; Entity count is too many; Model is workable; Some denormalisation; Poor entity naming choices across the majority of entities; Many superfluous entities OR/AND Many Missing entities</p> <p>4. An acceptable attempt at modelling the entities; Denormalised; Poor name choices; Lack of clarity; Difficulty in understanding the choices made; Entity abstraction from the case study is complex, difficult and lacking clarity of thought; Writing the SQL for these entities would be cumbersome.</p> <p>3. Significant issues with entity modelling. Mostly denormalised; Poor name choices; Lack of coherency; Inconsistent application in choices; Entity abstraction is obtuse; Writing SQL would be cumbersome.</p> <p>2. Unsatisfactory entity handling across the majority of the entities. Far too many; Far too few; Poor names (imagine writing the SQL for the entities: would the SQL be error prone and cumbersome?). Foreign Keys missing or wrong data types. <b>(COMMENT)</b></p> <p>1. Very Unsatisfactory. No demonstration of application of theory. Very poor choices for entities; Little evidence of normalisation; Cardinality is confused; Participation is misunderstood; No Primary Keys; Plagiarism <b>(COMMENT)</b></p>	<p>4. <b>Sensible attribute names. Easily understood by a manager. No ambiguity. Not too long in length.</b></p> <p>3. Appropriate attribute names. Mostly easily understood by a manager. Minor issues with interpretation, clarity of purpose in name choice.</p> <p>2. Satisfactory attribute names. Some issues with name choices. (e.g length), some issues with clarity of purpose in the attribute name choice Some very long attribute names. Some missing attributes</p> <p>1. An unsuccessful attempt. Attribute name choices are long; Attribute name choices are vague; Attribute names are ambiguous. Attribute names have spaces. Attribute names would be cumbersome to type in adhoc SQL. <b>(COMMENT)</b></p> <p>0. An unsatisfactory attempt. Plagiarism. <b>(COMMENT)</b></p>
Clarity of thought and layout. Most importantly suitability to the case study itself.					
Check for signs of plagiarism (conscious and unconscious) and similarity to other student attempts and previous assignment solutions.					

## Physical E.R. Model (continued)

CARDINALITY	Participation	Weak Strong Entities	Primary Key	PFK/FK	Normalisation	Readability, Format	Originality / Similarity / Plagiarism
<p>8. All Business rules were met without any cardinality issues; All relationships between entities have the correct cardinality;</p> <p>7. All Business rules were met without any cardinality issues; There are minor errors with relationships between cardinality (1-4);</p> <p>6. The majority of business rules were met without cardinality issues. There are a few errors with relationships between cardinality (4-8);</p> <p>5. Some business rules had cardinality issues. There are errors with relationships between cardinality (8 or more).</p> <p>4. Satisfactory but not without issues with cardinality affecting the business rules and overall ER Model. Consistent but incorrect application of cardinality;</p> <p>3. Significant cardinality errors; Inconsistent application of cardinality rules; Requirements of the case study would struggle to be met.</p> <p>2. Unsatisfactory cardinality errors; No clear application of the requirements of cardinality in an ER Model (COMMENT)</p> <p>1. Very unsatisfactory comprehension of the function of cardinality. Completely unworkable model as a result (COMMENT)</p> <p>0. Plagiarism</p>	<p>5. Clear consistent demonstration of correct participation choices</p> <p>4. Mostly correct participation choices; Some minor errors;</p> <p>3. Consistent but incorrect participation choices; Inconsistent participation choices; Inappropriate participation choices ; Satisfactory is OK; Workable is OK;</p> <p>2. Most participations are incorrect. EG forcing both sides to be mandatory when one must exist before the other. (COMMENT)</p> <p>1. No clear demonstration of what is the appropriate participation choice (COMMENT)</p> <p>0 Plagiarism</p>	<p>5. Excellent understanding and application of Weak/Strong Entities</p> <p>4. Mostly correct understanding of when an entity should be weak.</p> <p>3. Significant application of Weak Strong entity. Some entities have composite Primary keys which really don't need to have a composite primary key because of the Weak - Strong defined relationship</p> <p>2. Majority of entities have been forced into Strong / Weak relationships which do not need to be so. Primary keys which really don't need to have a composite primary key because of the Weak - Strong defined relationship (COMMENT)</p> <p>1. Unsatisfactory understanding of strong / weak entities. Plagiarism (COMMENT)</p>	<p>5. Excellent. Correct choice of Primary key. Correct choice of surrogate primary key; Correct choice of composite primary key;</p> <p>4. Very Good. Some minor errors</p> <p>3. Good. Some issues. Some unworkable choices, but the majority of PK choices is acceptable. This grade if VARCHAR is used as a PK in isolation</p> <p>2. Significant issues with the choices of Primary Key. This grade if over zealous application of Weak Strong entities has not produced the key from the superkey candidates. COMMENT</p> <p>1. Unsuccessful attempt. Most PK choices are incorrect. Most PK choices are inappropriate COMMENT</p>	<p>5. Foreign Keys match their parent primary keys; No issues; PFK choices are correct; Approach has made decisions to avoid ambiguity</p> <p>4. Foreign Keys match their parent primary keys; No issues; PFK choices are correct; Approach has some ambiguity in FK names when linked to PKs</p> <p>3. Foreign Keys match their parent primary keys; Minor issues; PFK choices are mostly correct. Minor instances a surrogate key would be better.</p> <p>2. Unsuccessful Attempt. Data type mismatch between FK and PK; PFK choices mostly incorrect. (COMMENT)</p> <p>1. Unsatisfactory (COMMENT)</p>	<p>4. Normalised ER Model. Text Book.</p> <p>3. Mostly normalised. Some denormalisation but case study requirements are met.</p> <p>2. A good first attempt</p> <p>1. Overtly denormalised. Most relations do not meet 3NF</p> <p>0. Significant errors; Significant denormalisation; COMMENT</p>	<p>1. I can read it.</p> <p>0. I had to open the mwb file. Unreadable; crowded; poor image; Incomplete;</p>	<p>COMMENT AND REPORT</p>

## Chen Conceptual models

Entities	Attributes	Multivalued/Composite/ Derived Attributes	Relationships	Key Constraints	Participation Constraints	Clarity / Readability
<p>10: All Entities are present and clearly identified as weak or normal</p> <p>8: All Entities are present and most are correct few extra / missing</p> <p>6: Some missing / additional entities /</p> <p>5: incorrect weak or normal - consistently incorrect identification of weak/normal entities; Satisfactory use of entities</p> <p>4: Many missing / Many additional entities / incorrect weak or normal / inconsistencies in use of Chen notation</p> <p>2: Unsatisfactory attempt (PLEASE EXPLAIN WHY)</p> <p>0: No submission No attempt; Plagiarism</p>	<p>10: Attributes are accurately diagrammed and use the correct Chen notation</p> <p>8: Attributes are accurately diagrammed and use the correct Chen notation Minor issues</p> <p>6: Attributed attributes in case study are diagrammed AND Most attributes use the correct Chen attribute type</p> <p>4: Several missing or additional attributes, incorrect Chen notation; Consistency in incorrect Chen notation</p> <p>3: Significant missing / Significant additional attributes, M:M resolved; Inconsistency in use of Chen notation</p> <p>1: Unsatisfactory. No demonstrated comprehension of Chen notation use and application. Plagiarism (COMMENT)</p>	<p>2: Multivalued, composite and derived attributes used correctly</p> <p>1: Some errors in the use of multivalued, composite and derived attributes</p> <p>0: Unsatisfactory attempt. Inconsistent use of Chen notation (demonstrated by incorrect use making no sense when interpreted) Plagiarism</p>	<p>5: ALL Relationships are correctly used and labelled</p> <p>4: Most relationships are correctly used, minor errors</p> <p>3: Some errors in relationships.</p> <p>2: Incorrect use of relationships; Consistent incorrect use of relationships</p> <p>1: Significant errors;</p> <p>0: Major misunderstanding of the idea of relationships, or no attempt. Plagiarism</p>	<p>10: Key constraints for all relationships and are correctly documented in Chen Notation</p> <p>8: Mostly correct Key constraints</p> <p>6: Good attempt at Key constraints and/or consistently incorrect use of Chen notation</p> <p>5: Satisfactory.</p> <p>3: Significant errors in Key Constraint choices; Inconsistent application of Key constraints</p> <p>1: Hybrid notation / no clear demonstration of understanding of key constraints using Chen notation. Plagiarism</p>	<p>8: Participation constraints for all relationships and are correctly documented in Chen Notation.</p> <p>7: Mostly correct Participation constraints and/or consistently incorrect use of Chen notation</p> <p>5: Good attempt at Participation constraints. A few minor or moderate errors in application and comprehension</p> <p>4: Satisfactory: Some mismatch in total/partial participation; Model becoming unworkable;</p> <p>3: Significant errors in Participation Constraint choices; Consistent incorrect choice of participation constraints</p> <p>2: Hybrid notation / Inconsistent notation demonstrating lack of comprehension.</p> <p>1: Unsatisfactory. Plagiarism</p>	<p>5: Excellent. Very legible easy to read</p> <p>4: Very Good. Legible easy to read. Minor issues</p> <p>3: Good. Legible, some layout / readability issues</p> <p>2: Crowded. Messy. Some difficulty in reading and interpreting the Chen model</p> <p>1: Unsatisfactory. Plagiarism</p>

**N.B.:**Each Assessment rubric is designed specifically to the needs of the case study. **Use this as guidance, not writ law.**

## Revisions – revisions to the document

In this section is the document history. After GA (General Availability) all changes in the document will be colour coded. Both the revised document and the original document will be preserved and available to students.

Date	Version	
14-Jan	$\alpha$	Initial Draft
10-Feb	$\beta$	First revision. Added details to all sections.
5-Feb	$\Gamma$	Second revision. Fixed typos and updated examples.
15-Mar	1.0 (GA)	Third revision. Peer reviewed (FM). Added the workbench file component. Changed the instructions for PKFK red key. General Availability and released to students.