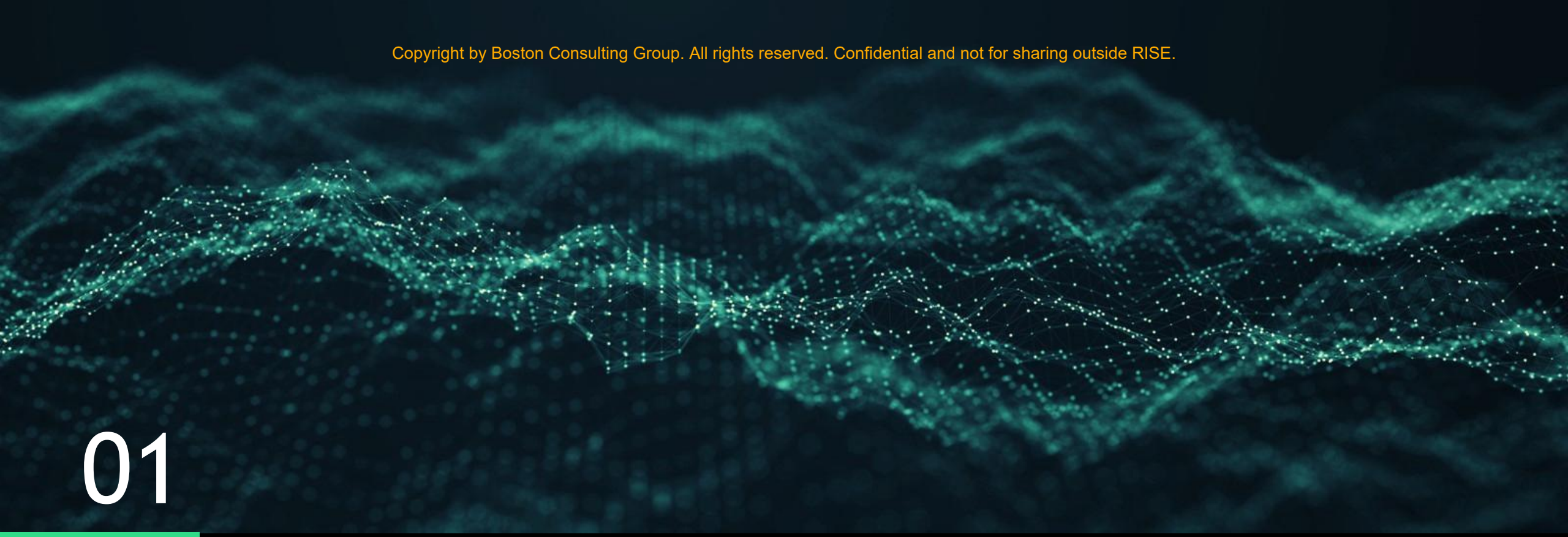
RISE FOR FINANCIAL SERVICES

Capstone Brief (DA)

2024



01

Overview of Capstone, and Technical Skill & Competencies (TSCs) covered

Overview of Capstone

This Capstone is an opportunity for you to bring together all the skills that you have built over the past ~20 weeks or so.

We will dedicate some time in Module 3 to solve this Capstone problem statement.

In terms of formal assessment, you will be assessed on the following Technical Skills & Competencies (TSCs), as stipulated under the SkillsFuture Skills Framework for the role of a data analyst/data engineer:

1. Design thinking
2. Stakeholder Management

Although you will not be formally assessed on the analytics component, we encourage you to use this Capstone as an opportunity to also practise and troubleshoot your technical skills – because in real life, these skills will need to be applied together with each other.

Design thinking Ability Statements

- You will be assessed on the following Ability statements for the **Design thinking** TSC:

Design thinking TSC: Ability Statements	
A1	Apply design thinking methodologies to define design problems and generate new ideas for the organisation
A2	Uncover opportunities for applying design thinking across the organisation
A3	Utilise metrics to benchmark and measure outcomes of design ideas and solutions
A4	Implement plans to embed design thinking across the organisation
A5	Facilitate the development and execution of design concepts through prototypes
A6	Present and communicate the design outcomes and process for design ideas
A7	Apply design thinking frameworks and tools to work processes

Stakeholder management Ability Statements

- You will be assessed on the following Ability statements for the **Stakeholder mgmt.** TSC:

Stakeholder management TSC: Ability Statements	
A1	Identify key stakeholders and the organisation's relationship with them
A2	Identify stakeholder needs, positions and interests
A3	Coordinate basic activities /and processes with stakeholders on a day-to-day basis
A4	Apply knowledge of the organisation's position to respond to simple queries from stakeholders

Capstone

Context

You are a data analyst in the credit risk function of a bank that issues credit cards. Typically, banks try to strike a balance between collecting interest revenue on outstanding card balances, and managing the risk that the cardholder will not be able to repay their balances.

Due to worsening macro-economic conditions, many banks want to more proactively manage the credit risk in their cardholder customer base. If there is an increase in card balances that are not repaid (defined as 90+ days past the due date of repayment[1]), the regulator will ask the bank to hold more capital – resulting in a direct cost to the bank.

Also, banks try to avoid having to enter debt collection with customers – as it typically results in a very negative customer experience for cardholders, and reputational risk for the bank.

Therefore, the bank wants to improve how to manage cardholders who may potentially fall behind on their repayments, earlier in the customer lifecycle.

You have been asked to:

- Predict customers' likelihood of default using relevant data
- Suggest how customers can be segmented, so the bank can focus its resources on higher-priority customers
- Work with the Credit Card Product team to:
  - Design targeted interventions along relevant cardholder customer journeys, to minimise chances that cardholders will not repay
  - Pitch your solutions to secure buy-in from different senior stakeholders across the bank

1. Also often referred to as DPD ("days past due")

Workflow to tackle the problem consists of three main steps

Focus on the right customers

- Clean and process data that is relevant to customers' likelihood of default
- Build a model to predict customer's likelihood of default
- Segment customers based on the data provided and decide which segments the bank should focus its resources on

Design the right solutions

- Conduct a user interview to understand customer's pain points and synthesize insights
- Ideate an impactful and feasible solution to solve the problem
- Leverage prototyping methodologies to create a suitable artifact to test with customers
- Estimate the impact that your solution will create for the targeted customer segment

Design thinking TSCs assessed

Secure buy-in

- Create a communication plan to align different stakeholders
- Define stakeholders' roles and responsibilities clearly for different stages of the communication plan
- Anticipate potential queries from stakeholders and prepare answers to these questions

Stakeholder mgmt. TSCs assessed

Expected Output

- Trained model to predict likelihood of default
- Data dashboard to visualize analysis
- Prioritized customer segmentation

Any design thinking artifacts you feel may be relevant, e.g. User interview, affinity diagramming, customer journey, persona profiling, creative matrix, Impact vs. Difficulty matrix, concept poster, storyboard

Any artefacts you feel may be relevant, e.g.
- Stakeholder management plan
- RACI matrix

Banks typically segment cardholders in these ways, to identify high priority customer segments and estimate the impact of a solution

Illustrative examples

Dimension	Segment	Classification
Credit limit given to the customer ($)	High net worth	Top 25 percentile
	Affluent	Between bottom and top 25 percentile
	Mass affluent	Bottom 25 percentile
Size of potential loss based on outstanding debt ($)	High loss	Top 25 percentile
	Medium loss	Between bottom and top 25 percentiles
	Low loss	Bottom 25 percentiles
Likelihood of default	High risk	90+ DPD
	Medium risk	60+ DPD
	Low risk	30+ DPD

As part of your Capstone, you will try to arrive at how to maximise the amount of outstanding balances collected

% reduction in likelihood of default for prioritised segment

×

Total outstanding debt of prioritised segment

$Xx

Total balances collected

02

Focus on the right customers: Analytical component

You will receive a dataset with customers' credit and demographic data

Data (column headers)	Description	File name
Limit_Bal	Amount of the given credit (NT dollar): it includes both the individual consumer credit and his/her family (supplementary) credit	credit_card_defaults
Sex, Education, Marital Status, Age	Demographic data	credit_card_defaults
BILL_AMT1, BILL_AMT2…BILLAMT6	6 months of bill statements	credit_card_defaults
PAY_AMT1, PAY_AMT2…PAYAMT6	6 months of payment history	credit_card_defaults
Default payment this month	Payment status for this month	credit_card_defaults

ID	LIMIT_BAL	SEX	EDUCATION	MARRIAGE	AGE	BILL_AMT1	BILL_AMT2	BILL_AMT3	BILL_AMT4	BILL_AMT5	BILL_AMT6	PAY_AMT1	PAY_AMT2	PAY_AMT3	PAY_AMT4	PAY_AMT5	PAY_AMT6	default payment this month
1	20000	2	2	1	24	3913	3102	689	0	0	0	0	689	0	0	0	0	1
2	120000	2	2	2	26	2682	1725	2682	3272	3455	3261	0	1000	1000	1000	0	2000	1
3	90000	2	2	2	34	29239	14027	13559	14331	14948	15549	1518	1500	1000	1000	1000	5000	0
4	50000	2	2	1	37	46990	48233	49291	28314	28959	29547	2000	2019	1200	1100	1069	1000	0
5	50000	1	2	1	57	8617	5670	35835	20940	19146	19131	2000	36681	10000	9000	689	679	0
6	50000	1	1	2	37	64400	57069	57608	19394	19619	20024	2500	1815	657	1000	1000	800	0

Detailed Steps for Model 1 Development: Default Prediction

1 Data Preprocessing

- Define target variable
- Missing value treatment

2 EDA & Feature Engineering

- **Exploratory Analysis**
  - Bivariates
  - Statistics
- **Feature Engineering and Selection**
  - Correlation Matrix
  - VIF
  - Importance charts

3 Model Creation and testing

- Train-test split
- Cross validation folds
- Examples of models that can be built
  - Logistic
  - Random Forest
  - Ensemble of models

4 Model Testing and Tuning

- Out of Sample testing
- Model Tuning such as Regularization in Logistic Regression, hyperparameter tuning in Random Forest etc.

Linking Analytics to Business

- Use the dataset for feature selection and engineering, model development and tuning (including train-test split and cross-validation)
- Use your champion model to predict default probability of new customers
- Use final values to find and focus on the default payments with greatest financial impact (e.g., based on average bill amount or payment amount)

Detailed Steps for Model 2 Development: Customer Segmentation

1 Define key objective

- Identify the target customer groups to focus on (e.g. high risk customers with high probability of default)

2 Data Preprocessing & Feature Selection

- Transform features
- Perform necessary Feature Engineering and Selection
- Scale data

3 Model Creation and Evaluation

- Select segmentation algorithm
- Train the segmentation model
- Evaluate and refine cluster quality (e.g. silhouette analysis, scree plots)

4 Cluster Analysis

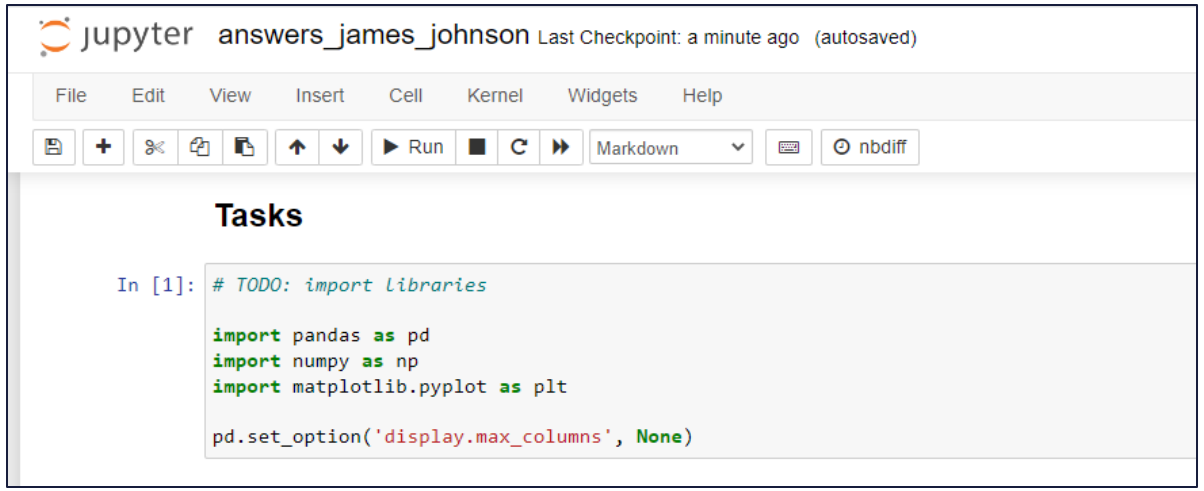
- Segment and analyse customers based on risk profiles, including demographics and payment behaviour
- Identify key insights of target customer group(s)

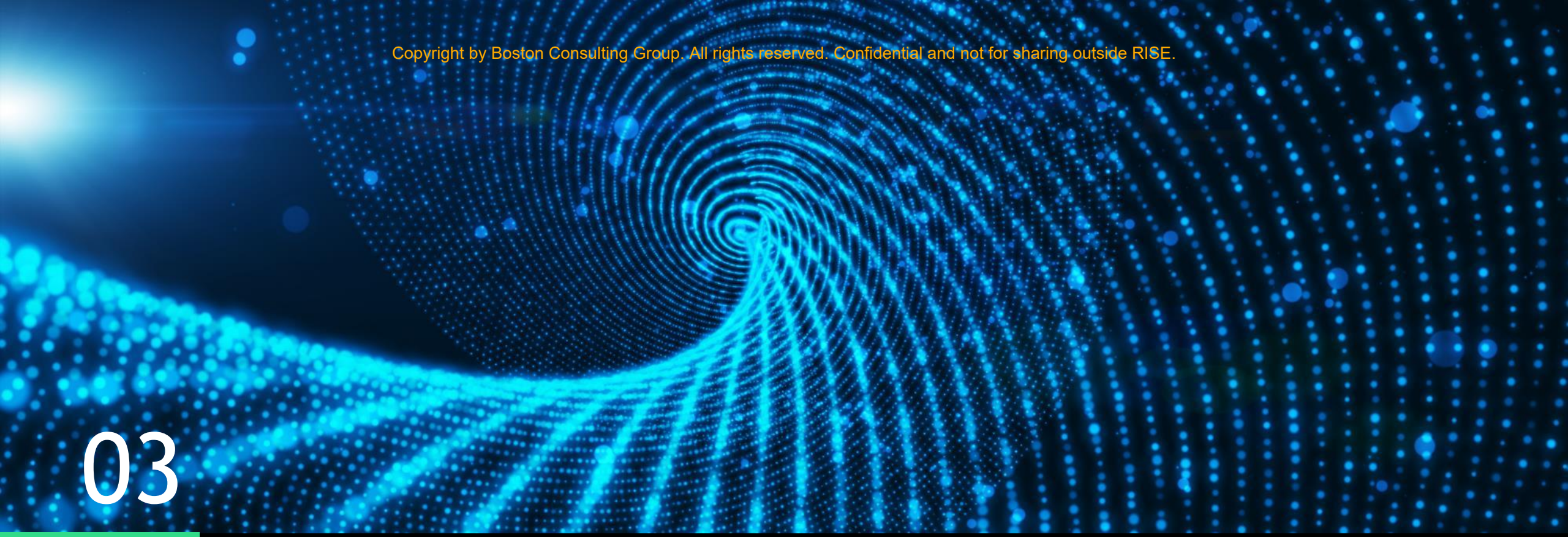
Linking Analytics to Business

- Perform in-depth data exploration on higher priority customer segments (e.g. customers with higher financial impact through default on payments)
- Identify key insights of such higher priority customer segments so the bank can focus its resources and better strategize on management of these cardholders

Expected Output – Jupyter Notebook

- You should code and save your answers in a **new Jupyter notebook**
- Ensure that the Python codes in the notebook can be executed without any errors
- Save the .ipynb file with a filename that includes your name e.g., *cp_assessment_james_johnson.ipynb*

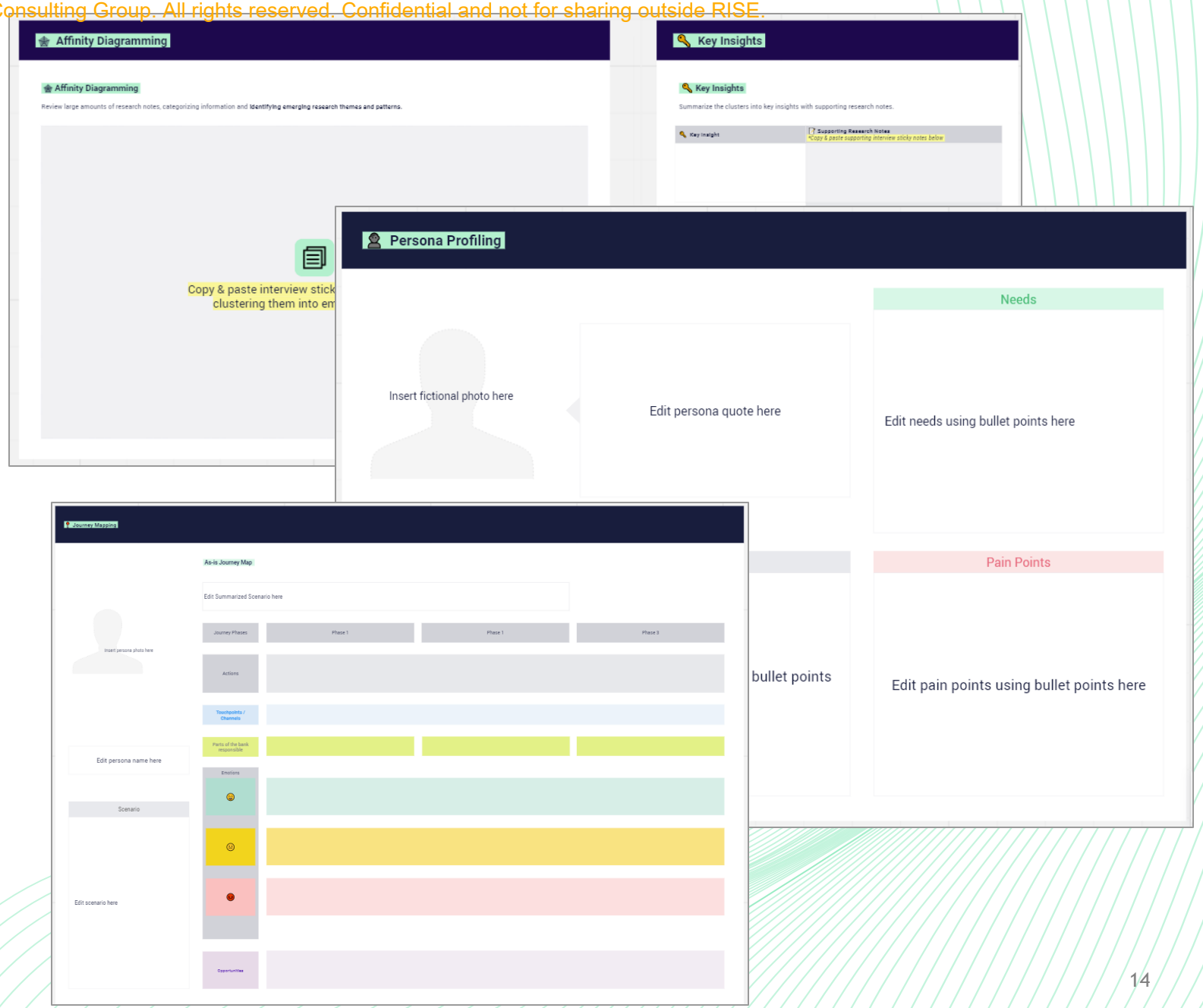




03

Design the right solutions: The Design Thinking component (Coach = Rithesh Shetty)

Your Design Thinking Miro board contains templates which may be useful – you can choose which are most relevant to you



04

Secure buy-in: The Stakeholder Management component (Coach = Andrew Osborne)

Some potential stakeholders you will work with

Credit card product Manager: Claire

- Responsible for: Overall profitability/profit and loss of credit card product. Needs to balance revenue and credit losses
- Cares about: Maximising number of cardholders, maximising card usage, maximizing both fee and interest revenue, reducing customer attrition

Credit risk Manager: Faris

- Responsible for: Setting the bank's appetite for credit risk in the Cards business, and minimizing the volume of outstanding card balances (i.e. balances not paid). Does not typically get involved in day-to-day decisions, but needs to sign off any requests for change in risk policy
- Cares about: Lending only to cardholders who can repay their balances

Collections Manager: Elaine

- Responsible for: Performance of the collections department for Cards business. Also responsible for the customer repayment journey once the customer is more than 60 days past due
- Cares about: Maximising the volume of balances that are repaid to the bank

Customer satisfaction manager: Harsha

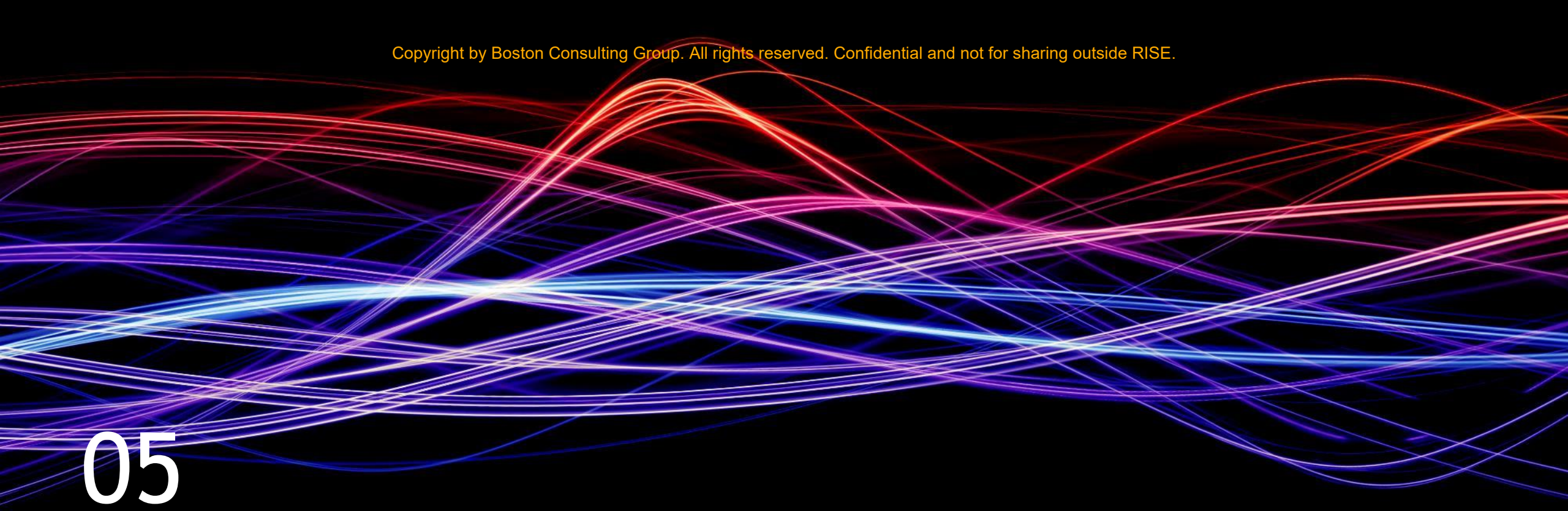
- Responsible for: Customer satisfaction metrics for the Cards business
- Cares about: Maximising Net Promoter Score, and minimizing customer complaints

Compliance Manager: Paul

- Responsible for: Ensuring that the Cards business is run in compliance with relevant rules and regulations, especially in terms of consumer welfare Cares about: Treating customers fairly and staying within the rules i.e. bank communications to customer is clear, fair and not misleading, customer is given sufficient notice on any action that bank may take (e.g. cancelling card), and collections process does not mistreat customer

Call centre Manager: Vincent

- Responsible for: Call centre operations
- Cares about: Resourcing and operational excellence. i.e. if there is any customer communication campaign that involves using the call centre, he must be given enough notice to staff and train a team properly



05

Group Presentation & Individual Q&A Sessions

You will have two assessments: one as a group and one individually

Assessment 1: Group Presentation

1. Prepare a 15-min presentation for your Manager at the bank to showcase what you've done in this project and to demonstrate you understand how to do the following
    i. Create a RACI chart to communicate roles and responsibilities of your stakeholders
    ii. Understand your stakeholders' interest, power, and impact on the organisation; and their positions, agendas, and priorities (which may be unspoken)
    iii. Create a stakeholder management plan
    iv. Work with stakeholders to understand problems, conflict, and feedback
2. You may have one or more of your team members present
3. After the 15-min group presentation, in the remaining 45 mins, be ready to answer questions put to each individual group member to demonstrate your knowledge and ability
4. You may use course material at any time

Assessment 2: Individual Q&A

1. Prepare for a 15-min individual Q&A session with the assessors.
2. The assessor will ask you questions that you can answer to demonstrate your ability in any of the TSC ability statements and your submitted work
3. You may use course material at any time

06

Project Logistics - Submission of project materials and evidence of submission

Assessment Timeline

Date	Time	Session Description
4 June 2024, Tuesday	2:00pm – 3:00pm	M3 Capstone Briefing
5 June 2024, Wednesday	10:00am – 12:00pm & 1:00pm – 5:30pm	Capstone coaching clinic and / or working session: **Analytics and design**
6 June 2024, Thursday	9:00am – 12:00pm	Capstone coaching clinic and / or working session: **Analytics and design**
6 June 2024, Thursday	1:00pm – 2:00pm	DA TSC 6 Written Assessment - Design Thinking Practice
6 June 2024, Thursday	2:15pm – 6:15pm	Capstone coaching clinic and / or working session: **Analytics and design**
11 June 2024, Tuesday	9:00am – 12:00pm & 1:00pm – 5:00pm	Capstone coaching clinic and / or working session: **Stakeholder management**
13 June 2024, Thursday	9:00am – 12:45pm	Capstone coaching clinic and / or working session: **Stakeholder management**
19 June 2024, Wednesday	By 11:59pm	Final Deliverables Submission (via TA and LMS)
20 June 2024, Thursday	10:00am – 11:00am	DA TSC 7 Written Assessment - Stakeholder Management
20 June 2024, Thursday	12:00pm – 6:00pm *(exact time to be advised closer to date)*	M3 Assessment Individual Q&A (15-min per individual)
21 June 2024, Friday	9:00am – 5:00pm *(exact time to be advised closer to date)*	M3 Capstone Group Presentation Assessment (1-hour per group)

Group submission

1. BCG is required to retain evidence of assessment submission, please refer to the following instructions.

2. If you are unable to submit all your files in one single email due to file size constraints, do it in multiple emails as needed.

	Deliverables submission
Deadline	19 Jun, Wed, 11.59PM
Email subject	DA M3 Assessment_Group number • E.g. DA M3 Assessment_Group 4
File naming conventions for (multiple) attachments	Group Number_File number and name • E.g. Group 4_01 Presentation.ppt • E.g. Group 4_02 Workplan.doc (if applicable)
Who submits	One group representative to submit all presentation files via email to your TA, with group members in copy.)

Individual submission

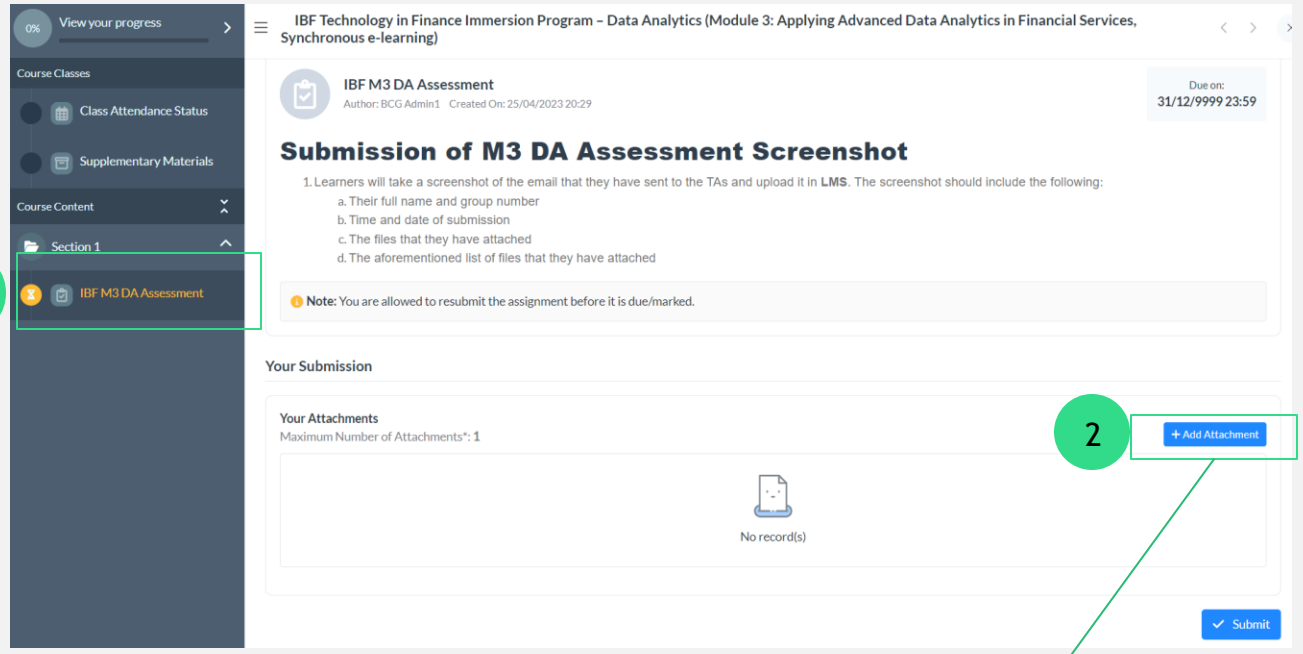
1. BCG is required to retain evidence of assessment submission, please refer to the following instructions:
2. If you are unable to submit all your files in one single email due to file size constraints, do it in multiple emails as needed.
3. Take a screenshot of the email to be used as submission on LMS (refer to next step)

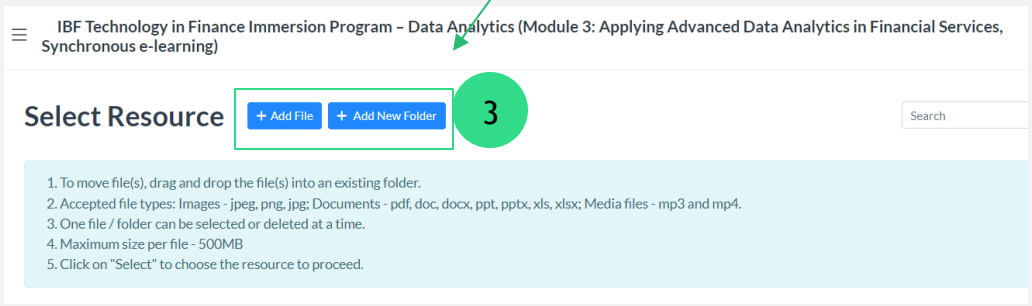
	Deliverables submission
Deadline	19 Jun, Wed, 11.59PM
Email subject	DA M3 Assessment_Group number_Individual Name • E.g. DA M3 Assessment_Group 4_Nur Rosdi
File naming conventions for (multiple) attachments	Group Number_Individual Name_File number and name • E.g. Group 4_Nur Rosdi_01 Workplan.doc • E.g. Group 4_Nur Rosdi_02 SQL script.sql • E.g. Group 4_Nur Rosdi_03 visualisation.pbix
Who submits	Each individual to submit all files (e.g., SQL, Jupyter Notebook) via email to your TA, followed by LMS screenshot submission.)

Submission of email screenshots (1/2)

Note:

- All learners are to **INDIVIDUALLY** make a submission on LMS
- Take a screenshot of individual email submission in previous step
- Rename screenshot as DA M3 Assessment_Group number_Individual name and upload to the correct IU



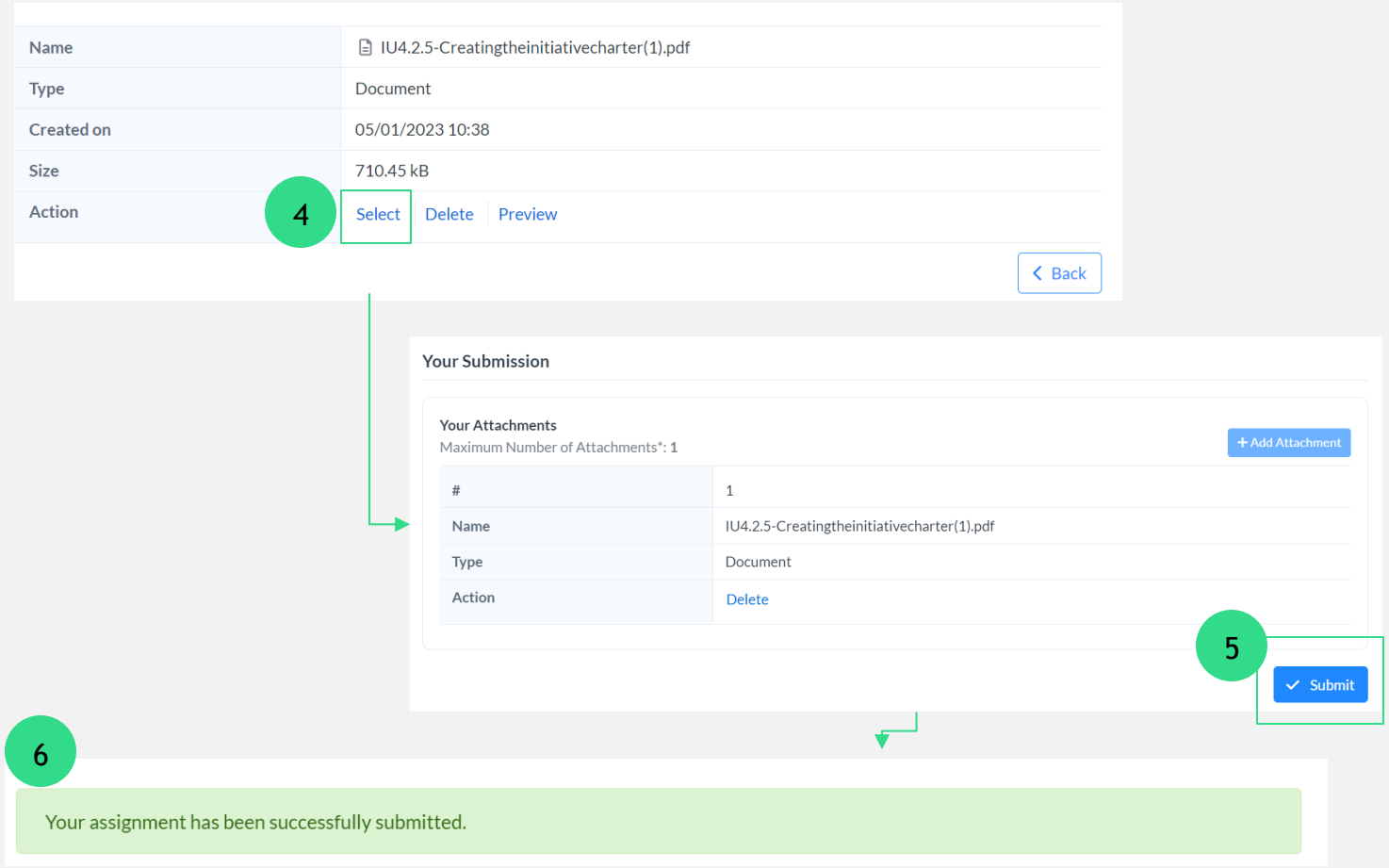


Steps

1. Select the IU on the course tab –
2. Click "Add Attachment"
3. When the new page pops up, click "Add File". Kindly upload your screenshot file

Submission of email screenshots (2/2)

- Note: All learners are to **INDIVIDUALLY** make a submission on LMS
- Take a screenshot of individual email submission in previous step
- Rename screenshot as DA M1 Assessment_Group number_Individual name and upload to the correct IU



Steps

4. Scroll down and click "Select"
5. You will be redirected back to the main submission page. Scroll down here and click "Submit"
6. You should see the pop up that your assignment has been successfully submitted

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