Research Methods and Professional Practice

End of Module Assignment

e-portfolio & Reflection

Murthy Kanuri

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E-PORTFOLIO home page link
https://m-kanuri.github.io/

E- Portfolio Research Methods and Professional Practice module link
https://m-kanuri.github.io/Module5.html

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1. Introduction (Unit 1)

The Research Methods and Professional Practice (RMPP) course has improved my academic and professional development. The reflection details my research journey from topic section and literature review to proposal drafting, enhancing my research abilities, critical thinking, and academic rigour. Using Gibbs' Reflective Cycle (1988) and the "What? So What? Now What?" framework (Rolfe et al., 2001), I reflect on my learning, emotional experiences, challenges, and how they will influence my future practice.

2. Identifying the Research Problem (Unit 2)

Initially, selecting a meaningful topic felt overwhelming due to numerous possibilities. Through discussions and reflection, I focused on the gender wage gap in the UK software industry, a topic aligned with my 20 years in IT. This decision shifted my thinking from broad interest to the practical application of research principles in forming a focused, researchable question. Supported by Creswell & Creswell (2018), this technique gave me a feeling of direction and improved my problem-solving abilities.

3. Developing Research Aims and Objectives (Unit 2)

Establishing precise research aims and objectives proved challenging. Initially, frustration arose from unclear goals. The feedback from my tutor helped me refine them using the SMART framework—Specific, Measurable, Achievable, Relevant, and Time-bound (Doran, 1981). For instance, I transformed a vague aim like "understanding the gender pay gap" into the more precise "evaluate structural and cultural factors contributing to the gender pay gap in the UK technology sector." This refinement brought clarity, aligning academic inquiry with practical relevance.

4. Literature Review and Critical Engagement (Unit 2, 8 &9)

The literature review was rewarding although demanding. I initially felt unsure of my level of comprehension and just summarised sources. After reading more carefully through reports from WISE (2023), the Office for

National Statistics (2023), and several academic sources, I identified key issues such as job segregation, limited leadership opportunities, and weak policy responses. This stage helped me learn how to judge the content and the research quality of different sources, as suggested by Bryman (2016). Biased or poorly designed studies can distort understanding, so recognising their limitations is essential. My confidence and satisfaction grew as I moved from description to critical analysis.

5. Choosing the Research Methodology (Units 3-7)

Choosing between qualitative and quantitative methodologies made me question my initial beliefs. I was initially inclined towards quantitative approaches for the objectivity, clarity and definitive outputs. However, considering the complexity, I realised qualitative methods such as interviews and thematic analysis (Silverman, 2016) were better suited. This in-depth exploration of methodology was an assessment process that made me challenged my assumptions. This led me to reevaluate the criteria for "valid" research and significantly improved my comprehension of ethical issues, including the importance of informed consent, participant privacy protection, and deliberately minimising researcher bias (Bell and Waters, 2018). Selecting the correct method meant balancing rigour with empathy and aligning data collection with research integrity.

6. Writing the Research Proposal (Unit 9 & 10)

Although writing the research proposal was difficult, it was eventually be neficial. One of my main priorities was ensuring everything flowed naturally into the next. The iterative proposal writing process, requiring persistence and multiple revisions, proved complex. Nevertheless, the document grew stronger and more cohesive with each edit, creating a sense of accomplishment. This analytical realisation clarified research as a dynamic, evolving rather than linear process. I also learned how important it is to write clearly and succinctly for academic purposes. This required careful elimination of superfluous material, enhanced concept transitions, and assurance that all assertions were sufficiently backed up by data and proof. I now completely understand the importance of excellent research writing for academic publication and effective professional communication (Booth, Colomb, and Williams, 2016).

7. Challenges and Growth (Units 9 & 11)

During this module, I had much trouble managing my time effectively. Stress was often caused by juggling the demands of the RMPP curriculu m with other academic obligations, personal life, and professional career. However, I gradually increased my control and accomplishment by creating a detailed project calendar and setting mini deadlines, which reduced the strain. Going beyond simply summarising facts to critically analysing them was another significant obstacle. This frequently caused me to be dissatisfied with my first drafts.

I strengthened this skill by asking questions like "What assumptions are being made?" "Is there another point of view?" and "Can these findings be applied to other situations?". These questions served as analytical catalysts and pushed me to look beyond superficial answers to a more in-depth analysis of underlying assumptions and opposing points of view. These questions significantly increased the scope and depth of my critical thinking. This noticeable development immediately affected my literature review and methodological design calibre.

Additionally, participating in collaborative learning activities, such as the Unit 1 and Unit 7 discussions, improved my ability to consider peer perspectives, articulate responses, and refine my arguments (see Appendix A). Beyond theoretical understanding, engaging directly with statistical exercises like hypothesis testing helped strengthening my practical numeracy skills.

8. Future Practice and Development (Unit 11)

The skills and abilities I have developed throughout the RMPP module will greatly benefit my professional work. In my professional capacity, I will use my improved critical thinking abilities to assess complex technological problems and ensure that the proposed solutions are supported by evidence-based reasoning.

My ability to 'use the proper methods' translates into designing and executing mini-research projects within my workplace, like conducting user surveys or analysing system data using appropriate methodologies. I now feel confident in my ability to tackle issues methodically, apply best research methods, and effectively present conclusions. These abilities are essential for thorough scholarly research, impactful technical reports,

data-driven plans, and perceptive consulting. (Saunders, Lewis, and Thornhill, 2019).

These core skills will also be essential to finishing my future dissertation, particularly when structuring my arguments, carrying out in depth literature evaluations, and ensuring the methodological integrity of my independent research. My personal skills matrix and action plan included in appendix and in GitHub.

9. Conclusion (Unit 12)

I have developed both personally and academically. Despite its challenges, the process was immensely fulfilling, from the initial hesitation while choosing a topic to creating a well-organised, ethically and methodologically sound research plan.

The RMPP module has not only provided me with an invaluable toolkit of academic research skills but has also instilled a newfound sense of personal confidence in my abilities. It has powerfully reaffirmed the critical importance of structured planning, deep critical engagement with information, and the continuous practice of reflection—skills that I am confident will be carried forward and applied effectively in my dissertation and professional future.

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11. Appendix A: e-Portfolio Links

Below are all e-portfolio artefacts submitted throughout the module, organised by unit and activity type.

UNIT	ACTIVITY	LINK
Landing Page	e-Portfolio Home	**https://m-kanuri.github.io/**
Module Home Page	Research Methods and Professional Practice Module	https://m-kanuri.github.io/Module5.html
Unit 1	Main Landing Page	https://m-kanuri.github.io/module5/2025/05/01/RMPP-Unit1.html
	Reasoning Quiz	**https://m-kanuri.github.io/artefacts/RMPP_Unit01_Reasoning%20Quiz.pdf**
	Collaborative Discussion - 1	Initial Post : https://m-kanuri.github.io/artefacts/RMPP-Unit01-InitialPost.pdf Peer Response : https://m-kanuri.github.io/artefacts/RMPP-Unit01-Peer_Response.pdf Summary Post : https://m-kanuri.github.io/artefacts/RMPP-Unit01-SummaryPost.pdf
	Reflective Activity – Ethics & AI	**https://m-kanuri.github.io/artefacts/RMPP-Unit01-Reflective%20Activity%201.pdf**
Unit 2	Main Landing Page	https://m-kanuri.github.io/module5/2025/05/08/RMPP-Unit2.html
	Proposal Outline	https://m-kanuri.github.io/artefacts/RMPP-Unit02-e-Portfolio%20Activity%201.pdf
Unit 3	Main Landing Page	**https://m-kanuri.github.io/module5/2025/05/15/RMPP-Unit3.html**
	Proposal Review	**https://m-kanuri.github.io/artefacts/RMPP-Unit03-e-Portfolio%20Activity.pdf**
Unit 4	Main Landing Page	https://m-kanuri.github.io/module5/2025/05/22/RMPP-Unit4.html
	Literature Review Outline	**https://m-kanuri.github.io/artefacts/RMPP_Unit04-LiteratureReview_Outline.pdf**
Unit 5	Main Landing Page	**https://m-kanuri.github.io/module5/2025/05/29/RMPP-Unit5.html**
	Reflective Activity 2	**https://m-kanuri.github.io/artefacts/RMPP-Unit05-e-Portfolio%20Activity%20Reflective%20Activity%202.pdf**
	Wiki Activity (Questionnaires)	**https://m-kanuri.github.io/artefacts/RMPP-Unit05-Wiki%20Activity.pdf**

UNIT	ACTIVITY	LINK
Unit 6	Main Landing Page	https://m-kanuri.github.io/module5/2025/06/03/RMPP-Unit6.html
Unit 7	Main Landing Page	**https://m-kanuri.github.io/module5/2025/06/05/RMPP-Unit7.html**
	Hypothesis Testing worksheet	• https://m-kanuri.github.io/artefacts/RMPP_Unit07_7.1Excercise.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit07_7.2Excercise.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit07_7.3Excercise.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit07_7.4Excercise.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit07_7.5Excercise.xlsx
	Collaborative Discussion -2	Initial Post : **https://m-kanuri.github.io/artefacts/RMPP-Unit07-Initial_Post.pdf** Peer Response : **https://m-kanuri.github.io/artefacts/RMPP-Unit07-Peer_Responses.pdf** Summary Post : **https://m-kanuri.github.io/artefacts/RMPP-Unit07-Summary_Post.pdf**
	Summary Measures Worksheet	• https://m-kanuri.github.io/artefacts/RMPP_Unit07_Excercise6.1.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit07_Excercise6.2.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit07_Excercise6.3.xlsx
Unit 8	Main Landing Page	https://m-kanuri.github.io/module5/2025/06/17/RMPP-Unit8.html
	Inference Worksheet	Covered in Unit 7 and 9
	Research Proposal Outline	https://m-kanuri.github.io/artefacts/RMPP_Unit08-ResearchProposal_Outline.pdf
Unit 9	Main Landing Page	**https://m-kanuri.github.io/module3/2025/01/13/ML-Unit9.html**
	Charts Worksheet	• https://m-kanuri.github.io/artefacts/RMPP_Unit9_Exe%209.1D.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit9_Exe%209.2E.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit9_Exe%209.3B.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit9_Exa%209.1D.xlsx • https://m-kanuri.github.io/artefacts/RMPP_Unit9_Exa%209.3B.xlsx
	Visualisation with Power BI	• https://m-kanuri.github.io/artefacts/RMPP_Unit09_Financial_Sample_Dashboard.pdf • https://m-kanuri.github.io/artefacts/RMPP_Unit09_Financial_Sample_Dashboard.pbix

UNIT	ACTIVITY	LINK
Unit 10	Main Landing Page	**https://m-kanuri.github.io/module5/2025/07/01/RMPP-Unit10.html**
	Research Proposal Presentation	• https://m-kanuri.github.io/artefacts/RMPP_Unit10_Research%20Proposal%20Presentation.pdf • https://m-kanuri.github.io/artefacts/RMPP_Unit10_Transcript-Research%20Proposal%20Presentation.pdf
Unit 11	Main Landing Page	https://m-kanuri.github.io/module5/2025/07/06/RMPP-Unit11.html
Unit 12	Self-Test Quiz	https://m-kanuri.github.io/artefacts/RMPP_Unit12_PM_QUIZ.pdf
	End of Module Assignment - Reflection	This document

12. Appendix B: Personal Skills Matrix and Action Plan

This Personal Skills Matrix and Action Plan describes my self-assessed present competencies and provides a roadmap for future growth that is in line with what I have learnt in this module.

SKILL	LEVEL	EVIDENCE	ACTION PLAN
TIME MANAGEMENT	Expert	Met deadlines by completing quizzes, reflections, proposal drafts for the RMPP units.	Keep organising dissertation phases with time-blocked calendars. Manage the tasks through JIRA.
CRITICAL THINKING & ANALYSIS	Developing	Identified bias and evaluated source reliability during the literature review (Bryman, 2016).	Examine client-facing AI proposals critically and challenge technical specifications' presumptions before putting them into practice.
COMMUNICATION & LITERACY	Proficient	Prepared well-organised reports and gave helpful feedback in peer forums	Review dissertation drafts using peer comments to improve writing clarity. Improvise to speak in tech talks.
IT AND DIGITAL	Proficient	Used survey tools, statistical functions in Excel, and data visualisation tools for the tasks.	Make Power BI dashboards for internal IT project reporting and dissertation visualisations.
NUMERACY	Developing	Completed worksheets on hypothesis testing and statistical analysis (Unit 6–7).	Using online courses and tutorials to review complex statistical ideas and how they are applied.
RESEARCH	Proficient	Matched objectives with SMART goals and made good use of scholarly databases.	Plan the dissertation using a systematic approach and monitor journal readings monthly.
INTERPERSONAL	Proficient	Took part in group discussions and peer reviews. Journals were used to reflect on feedback.	Conduct a literature review or ethics study group discussion and provide summary comments.

SKILL	LEVEL	EVIDENCE	ACTION PLAN
PROBLEM SOLVING	Proficient	Survey design problems were fixed, the methodology was made clearer by comments, and the proposal was updated appropriately.	Throughout the dissertation phase, create a research FAQ or error log and distribute it to colleagues.
ETHICAL AWARENESS	Proficient	Incorporated ethical concepts into research design, such as consent, anonymity, and data handling (Bell & Waters, 2018)	Examine actual case studies on consent and data privacy to get professional advice.

13. Appendix C : Continuous Development Plan

GOAL	WHAT	WHEN
Enhance clarity and structure in academic communication	Participate in writing workshops and seek constructive critiques from tutors or peers.	Ongoing
Develop confident and engaging public speaking skills	Strengthen presentation delivery by rehearsing regularly, recording sessions for review, and participating in a speaking club if required.	October 2025
Gain proficiency in Microsoft Power BI for data visualisation	Enrol in an introductory Power BI course to build interactive dashboards and gain hands-on experience with visualising sample datasets.	By end of 2025
Stay current with emerging trends in AI and data ethics	Stay informed on developments in AI and ethical practices through curated blogs, newsletters, and periodic webinars.	Regular monthly check-ins
Attain a recognised professional certification	Pursue an industry-recognised certification such as UX design, Agile methodologies, or Power BI to support ongoing career development.	Within the next year

14. Appendix D : Continuous Development Plan - Broader Professional Development

- The full consolidated Professional Skills Matrix and Continuous Development Plan can be accessed via the following GitHub link: https://m-kanuri.github.io/artefacts/Skills%20Matrix.xlsx
- This spreadsheet includes evidence of personal and module-based skill development across all five MSc AI modules, mapped to competencies, tools, and learning outcomes.

15. Appendix E : Collaborative Learning Discussions 1 & 2

Summary Post

Summary Post

by Linga Murthy Kanuri - Monday, 7 July 2025, 9:40 PM

In my initial post, I discussed the moral and professional duties Abi has when selectively reporting data. While this behaviour may be legally acceptable in some contexts, presenting only favourable results can amount to *p-hacking* or *data dredging* (Head et al., 2015), which risks misleading stakeholders and undermining ethical standards. I used the ASA Code of Ethics (American Statistical Association, 2018) and the UK Data Ethics Framework (Cabinet Office, 2020) to say that Abi must be honest about good and bad results. The discussion also touched upon how consumer protection laws might affect the situation and suggested three options: complete reporting with caveats, consulting an ethics board, or blowing the whistle.

Sultan Alaryani discussed the importance of honesty in research and the need to examine differences between cultures and sectors. She said that different industries have different needs and pressures that greatly affect data reporting requirements.

Martyna Antas expanded on this by comparing regulatory frameworks in the pharmaceutical and food sectors, arguing that weaker external controls increase individual ethical responsibility. She also discussed the concept of **moral licensing**, where professionals justify biased choices based on perceived good intentions (Merritt, Effron and Monin, 2010). She emphasised the role of ethical data communication in framing and interpretation (Mäntymäki et al., 2022).

In response to Martyna, I introduced **Moor's (1985)** concept of a *policy vacuum*, arguing that the absence of organisational guidance can lead to ethical uncertainty. I also examined how organisational culture, stakeholder responsibilities (Freeman, 1984), and corporate governance structures can support or hinder ethical behaviour (Martin, Rao and Sloan, 2009).

In replying to Sultan, I reinforced the risks of reporting bias again. I raised Moor's argument again, saying that professional codes should be used as ethical safeguards when things aren't clear. I also agreed with stakeholder analysis and the moral rules of beneficence and non-maleficence (Beauchamp and Childress, 2019).

The discussion underscored the complex intersection of legal, ethical, organisational, and cultural factors in responsible data reporting.

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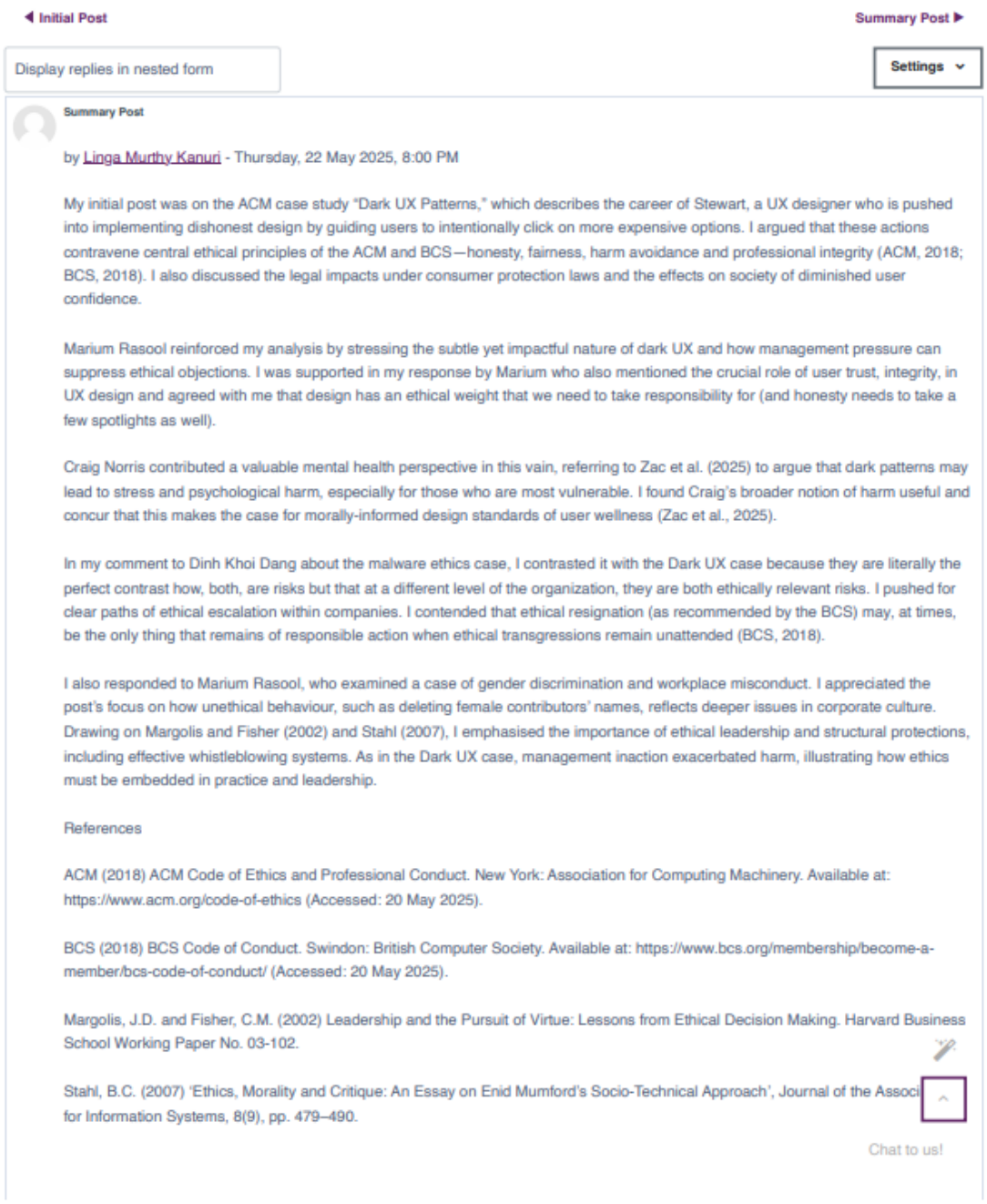
Summary Post



Summary Post

◀ Summary Post Initial Post ▶

Display replies in nested form Settings

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Chat to us!


RMPP_PCOM7E April 2025 B / e-Portfolio Activity: Collaborative Learning Discussion 1 / Summary Post
e-Portfolio Activity: Collaborative Learning Discussion 1
Forum
Reports
Summary Post
Initial Post
Summary Post
Display replies in nested form
Settings
Knowledge Base
Summary Post
by Linga Murthy Kanuri - Thursday, 22 May 2025, 8:00 PM
My initial post was on the ACM case study "Dark UX Patterns," which describes the career of Stewart, a UX designer who is pushed into implementing dishonest design by guiding users to intentionally click on more expensive options. I argued that these actions contravene central ethical principles of the ACM and BCS—honesty, fairness, harm avoidance and professional integrity (ACM, 2018; BCS, 2018). I also discussed the legal impacts under consumer protection laws and the effects on society of diminished user confidence.
Marium Rasool reinforced my analysis by stressing the subtle yet impactful nature of dark UX and how management pressure can suppress ethical objections. I was supported in my response by Marium who also mentioned the crucial role of user trust, integrity, in UX design and agreed with me that design has an ethical weight that we need to take responsibility for (and honesty needs to take a few spotlights as well).
Craig Norris contributed a valuable mental health perspective in this vain, referring to Zac et al. (2025) to argue that dark patterns may lead to stress and psychological harm, especially for those who are most vulnerable. I found Craig's broader notion of harm useful and concur that this makes the case for morally-informed design standards of user wellnes
2025).
Chat to us!

16. Hypothesis Testing Worksheets

The sheets are available in GitHub : https://m-kanuri.github.io/module5/2025/06/05/RMPP-Unit7.html

a. 7.1 Exercise

Exercise 7.1
mean impurity differed between the two filtration agents in Data Set G. Suppose instead a one-tailed test had been conducted to determine whether Filter Agent 1 was the more effective. What would your conclusions have been?
Note:There is no prior exercise on filtration agents referenced in this workbook. It appears that the original exercise (possibly Exercise 7.1) may have been removed or not updated. The current analysis assumes what the original two-tailed test assignment might have been, and proceeds by conducting a one-tailed test instead.

t-Test: Paired Two Sample for Means		
	Agent1	*Agent2*
Mean	8.25	8.683333333
Variance	1.059091	1.077878788
Observations	12	12
Pearson Correlation	0.901056	
Hypothesized Mean Difference	0	
df	11	
t Stat	-3.263939	
P(T<=t) one-tail	0.003773	
t Critical one-tail	1.795885	
P(T<=t) two-tail	0.007546	
t Critical two-tail	2.200985	
Difference in Means	-0.433333	

One-Tailed t-Test Analysis	
for p-value (one-tail)	0.00377
Null Hypothesis (H_0)	Mean impurity of Agent1 ≥ Agent2
Alternative Hypothesis (H_1)	Mean impurity after filtration by Agent 1 is less than Agent 2
p (one-tail) = 0.00377 <0.05	Reject the null hypothesis.
Conclusion	There is a statistically significant difference suggesting that Agent1 is more effective
Interpretation	Agent 1 has a significantly lower mean impurity than Agent 2. Since lower impurity
Justification	The use of a one-tailed test is valid because the hypothesis specifically tested

Two-Tailed t-Test Analysis	
for p-value (two-tail)	0.0075
Null Hypothesis (H_0)	Mean impurity is the same for Agent1 and Agent2 ($\mu_1 = \mu_2$)
Alternative Hypothesis (H_1)	Mean impurity is not equal between Agent1 and Agent2 ($\mu_1 \neq \mu_2$)
p-value p = 0.0075 < 0.05	Reject the null hypothesis.
Conclusion	There is a significant difference in mean impurity between Agent1 and Agent2.

b. 7.2 Exercise

Exercise 7.2 : Consider the bank cardholder data of Data Set C. Open the Excel workbook Exa8.6C.xlsx which contains this data from the Exercises folder. Assuming the data to be suitably distributed, complete an appropriate test of whether the population mean income for males exceeds that of females and interpret your findings. What assumptions underpin the validity of your analysis, and how could you validate them?

F-Test Two-Sample for Variances		
	Male Income	*Female Income*
Mean	52.91333333	44.23333333
Variance	233.1289718	190.1758192
Observations	60	60
df	59	59
F	1.225860221	
P(F<=f) one-tail	0.21824624	
F Critical one-tail	1.539956607	
p2	0.43649248	

Male Income	
n	20.0
Mean	55.0
SD	80.6

Female Income	
n	60.0
Mean	44.2
SD	13.8

t-Test: Two-Sample Assuming Equal Variances		
	Male Income	*Female Income*
Mean	52.91333333	44.23333333
Variance	233.1289718	190.1758192
Observations	60	60
Pooled Variance	211.6523955	
Hypothesized Mean Difference	0	
df	118	
t Stat	3.267900001	
P(T<=t) one-tail	0.000709735	
t Critical one-tail	1.657869522	
P(T<=t) two-tail	0.00141947	
t Critical two-tail	1.980272249	
Mean Difference	8.68	

Test	Details / Values
t-Test Assuming Equal Variances	
Null Hypothesis (H_0)	Population variances of male and female incomes are equal
Alternative Hypothesis (H_1)	Population variances of male and female incomes are not equal
p-value	0.4365
Decision	$p = 0.43 > 0.05 \rightarrow$ Fail to reject H_0
Conclusion	Variances are not significantly different → assume equal variances
t-Test Assuming Equal Variances	
Null Hypothesis (H_0)	Population mean incomes of males and females are equal
Alternative Hypothesis (H_1)	Population mean income for males is greater than for females
p-value (one-tail)	0.00071
t-statistic	3.268
t-critical (one-tail)	1.658
Decision	$p < 0.05$ and $t >$ t-critical →Reject H_0
Difference in Means	8.68 (males higher)
Conclusion	The mean income for males is significantly higher than for females

c. 7.3 Exercise

Exercise 7.3
Consider the filtration data of Data Set G. Open the Excel workbook Exa8.4G.xlsx which contains these data from the Exercises folder. Assuming the data to be suitably distributed, complete a two-tailed test of whether the population mean impurity differs between the two filtration agents, and interpret your findings.

t-Test: Paired Two Sample for Means		
	Variable 1	*Variable 2*
Mean	8.25	8.683333333
Variance	1.059090909	1.077878788
Observations	12	12
Pearson Correlation	0.901055812	
Hypothesized Mean Difference	0	
df	11	
t Stat	-3.263938591	
P(T<=t) one-tail	0.003772997	
t Critical one-tail	1.795884819	
P(T<=t) two-tail	0.007545995	
t Critical two-tail	2.20098516	

Mean (Agent1)	8.25
Mean (Agent2)	8.68
Mean difference (Agent1 - Agent2)	-0.433333333
Null Hypothesis (H_0)	Mean impurity is the same for both agents
Alternative Hypothesis (H_1)	Mean impurity differs between agents
t-Statistic	-3.264
p-Value (two-tail)	0.0075
Significance Level (α)	0.05
Decision	Reject the null hypothesis
Conclusion	There is a significant difference in mean impurity between Agent 1 and 2

d. 7.4 Exercise

Exercise 7.4
Recall that in Exercise 8.4, a two-tailed test was undertaken of whether the population mean impurity differs between the two filtration agents in Data Set G.Suppose instead a one-tailed test had been conducted to determine whether Filter Agent 1 was the more effective. What would your conclusions have been?

t-Test: Paired Two Sample for Means		
	Agent1	*Agent2*
Mean	8.25	8.683333
Variance	1.059091	1.077879
Observations	12	12
Pearson Correlation	0.901056	
Hypothesized Mean Difference	0	
df	11	
t Stat	-3.263939	
P(T<=t) one-tail	0.003773	
t Critical one-tail	1.795885	
P(T<=t) two-tail	0.007546	
t Critical two-tail	2.200985	
Difference in Means	-0.433333	

Two-Tailed t-Test Analysis	
for p-value (two-tail)	0.0075
Null Hypothesis (H_0)	Mean impurity is the same for Agent1 and Agent2 ($\mu_1 = \mu_2$)
Alternative Hypothesis (H_1)	Mean impurity is not equal between Agent1 and Agent2 ($\mu_1 \neq \mu_2$)
p-value p = 0.0075 < 0.05	Reject the null hypothesis.
Conclusion	There is a significant difference in mean impurity between Agent1 and Agent2.

One-Tailed t-Test Analysis	
for p-value (one-tail)	0.00377
Null Hypothesis (H_0)	Mean impurity of Agent1 ≥ Agent2
Alternative Hypothesis (H_1)	Mean impurity after filtration by Agent 1 is less than Agent 2
p (one-tail) = 0.00377 <0.05	Reject the null hypothesis.
Conclusion	There is a statistically significant difference suggesting that Agent1 is more effective than Agent2 in reducing impurity.
Interpretation	A one-tailed paired t-test was conducted to determine whether Filter Agent 1 results in lower mean impurity than Filter Agent 2, indicating it is more effective.
Justification	There is strong statistical evidence that Filter Agent 1 is more effective than Filter Agent 2, as it produces a significantly lower mean impurity level.

e. 7.5 Exercise

Exercise 7.5 : Consider the bank cardholder data of Data Set C. Open the Excel workbook Exa7.6C.xlsx which contains this data from the Exercises folder. Assuming the data to be suitably distributed, complete an appropriate test of whether the population mean income for males exceeds that of females and interpret your findings. What assumptions underpin the validity of your analysis, and how could you validate them?

F-Test Two-Sample for Variances		
	Male Income	*Female Income*
Mean	52.91333333	44.23333333
Variance	233.1289718	190.1758192
Observations	60	60
df	59	59
F	1.225860221	
P(F<=f) one-tail	0.21824624	
F Critical one-tail	1.539956607	
p2	0.43649248	

Male Income	
n	20.0
Mean	55.0
SD	80.6

Female Income	
n	60.0
Mean	44.2
SD	13.8

t-Test: Two-Sample Assuming Equal Variances		
	Male Income	*Female Income*
Mean	52.91333333	44.23333333
Variance	233.1289718	190.1758192
Observations	60	60
Pooled Variance	211.6523955	
Hypothesized Mean Di	0	
df	118	
t Stat	3.267900001	
P(T<=t) one-tail	0.000709735	
t Critical one-tail	1.657869522	
P(T<=t) two-tail	0.00141947	
t Critical two-tail	1.980272249	
Mean Difference	8.68	

Test	Details / Values
t-Test Assuming Equal Variances	
Null Hypothesis (H_0)	Population variances of male and female incomes are equal
Alternative Hypothesis (H_1)	Population variances of male and female incomes are not equal
p-value	0.4365
Decision	p = 0.43 > 0.05 → Fail to reject H_0
Conclusion	Variances are not significantly different → assume equal variances
t-Test Assuming Equal Variances	
Null Hypothesis (H_0)	Population mean incomes of males and females are equal
Alternative Hypothesis (H_1)	Population mean income for males is greater than for females
p-value (one-tail)	0.00071
t-statistic	3.268
t-critical (one-tail)	1.658
Decision	p < 0.05 and t > t-critical →Reject H_0
Difference in Means	8.68 (males higher)
Conclusion	The mean income for males is significantly higher than for females
Interpretation	There is strong statistical evidence that the mean income of males is significantly higher than that of females in this dataset (p < 0.05). The difference is not likely due to random variation.
Assumptions	Income data for individuals is independent.Each group's income distribution is approximately normal.

17. Appendix F : Sample Power BI Dashboard