A MAIN STUDY - TASK DESIGN

A.1 Description of the task

A bank has implemented a new loan application system where potential customers apply for a loan online and then the company assesses the eligibility of the customer for the loan.

<Configuration [*No human oversight*] or [*With human oversight*]>

Kim, a potential customer, is looking for funding opportunities to <task> and has thus decided to apply for a <task> loan through the bank's online platform. As part of the <task> loan application process, the bank has requested the following information:

- Applicant annual income
- Co-applicant (if any) annual income
- Credit score
- Date of birth
- Employment status
- Education
- Loan amount requested
- Loan amount term (months)
- Loan purpose
- Number of dependents

A few hours after sending the requested information, Kim has received an email with the final decision: the loan has been rejected.

<Configuration [*No explanation*] or [*With explanations*]>

<Configuration [*No contestability*] or [*Contest initial decision*] or [*Contest decision maker*]>

Table 1: Overview of the scenario.

Parameters	Conditions	Descriptions
Explainability	No explanation	*The artificial intelligence system uses some of this information for making the loan decision.*
	With explanations	*In the email received by Kim, an explanation of how the decision-making system has reached the conclusion is included. The email includes the importance that each piece of information provided by Kim had in the final decision. Factors are listed from the most important to the least important factor based on the bank's criteria. The magnitude of the contribution of each piece of information (negative (−) means that it contributed to the rejection decision) is added between brackets:* *Credit Score (−0.15) > Loan amount requested (−0.12)> Total annual income (−0.09)> Loan purpose (+0.02)> Employment status (+0.02)> Loan amount term (months) (−0.03)> Date of birth (+0.03)> Co-applicant (if any) income (+0.01)> Number of dependents (−0.07)> Education (+0.02)* *The email also includes information about scenarios where the individual would have been granted the loan. Kim would have been granted a loan if one of the following scenarios had been true:* • *The loan amount requested had been 5% lower* • *The total annual income of the individual had been 10% higher* • *The credit score of the individual had been "Very Good"*
Human oversight	No human oversight	*Given the latest technological advances and in an effort to make loan decisions in a timely manner, the loan application process is now fully automated. An artificial intelligence system receives the online requests and evaluates each case. An email is sent to the applicants with the final verdict.*
	With human oversight	*Given the latest technological advances and in an effort to make loan decisions in a timely manner, the loan application process is now hybrid: it combines artificial intelligence with human expertise. This involves a two-step approval process. In the first step, an artificial intelligence system receives the online requests and evaluates each case. If the artificial intelligence system reaches a decision (approve or reject) with a high confidence, an email is sent to the applicant with the final verdict. If the artificial intelligence system has a low confidence over the decision, there is a second step where a human oversees the decision and makes the final verdict and an email is sent to the applicant.*
Contestability	No contestability	*Since the reason for introducing an artificial intelligence system is to handle home loan applications in a timely manner, Kim has no option to request a review of the decision.*
	Contest initial decision	*Kim has decided to appeal the decision and has asked for a review of the process. As part of the review procedure, Kim has the opportunity to make objections about the initial decision and provide any information to support the application. The same artificial intelligence system will then reevaluate the home loan application.*
	Contest decision maker	*Kim has decided to appeal the decision and has asked for a review of the process. As part of the review procedure, Kim has the opportunity to ask for a human to review the process. This human reviewer will make a completely new decision with the information that Kim already provided for the initial decision.*
Task stakes	High stakes	*Buy a house / home loan*
	Low stakes	*Go on holiday / holiday loan*

Table 2: Summary of the experimental design.

A bank has implemented a new loan application system where potential customers apply for a loan online and then the company assesses the eligibility of the customer for the loan.

Given the latest technological advances and in an effort to make loan decisions in a timely manner, the loan application process is now hybrid: it combines artificial intelligence with human expertise. This involves a two-step approval process. In the first step, an artificial intelligence system receives the online requests and evaluates each case. If the artificial intelligence system reaches a decision (approve or reject) with a high confidence, an email is sent to the applicant with the final verdict. If the artificial intelligence system has a low confidence over the decision, there is a second step where a human oversees the decision and makes the final verdict and an email is sent to the applicant.

Kim, a potential customer, is looking for funding opportunities to buy a house and has thus decided to apply for a home loan through the bank's online platform. As part of the home loan application process, the bank has requested the following information:

- Applicant annual income
- Co-applicant (if any) annual income
- Credit score
- Date of birth
- Employment status
- Education
- Loan amount requested
- Loan amount term (months)
- Loan purpose
- Number of dependents

The hybrid loan decision-making system uses some of this information for making the loan decision.

A few days after sending the requested information, Kim has received an email with the final decision: the loan has been rejected.

Kim has decided to appeal the decision and has asked for a review of the process. As part of the review procedure, Kim has the opportunity to ask for a different human to review the process. This human reviewer will make a completely new decision with the information that Kim already provided for the initial decision.

Figure 1: Screenshot of one of the presented scenarios (No explanation, With human oversight, Contest decision maker, High stakes).

A.2 Measurements

A.2.1 Dependent variables. A. Items to measure *informational fairness*. Assessed on a seven-point Likert scale (1 = completely disagree, 7 = completely agree).

(1) The bank thoroughly explains how the information provided by Kim is used for making a decision.
(2) The explanations regarding the <task> decision-making are reasonable.
(3) The explanations are tailored to Kim's specific needs.
(4) I understand the way the bank uses the information to make decisions.

B. Items to measure *procedural fairness*. Assessed on a seven-point Likert scale (1 = completely disagree, 7 = completely agree).

(1) Kim is able to express their views and feelings during the <task> decision-making process.
(2) Kim has influence over the decision arrived at by this procedure.
(3) The <task> decision-making is applied consistently.
(4) The <task> decision-making is free of bias.
(5) The <task> decision-making is based on accurate factors.
(6) Kim is able to appeal the decision arrived at by this process.
(7) The <task> decision-making process upholds ethical and moral standards.

C. Item to measure *overall fairness*. Assessed on a seven-point Likert scale (1 = completely disagree, 7 = completely agree).

(1) The <task> decision-making process is fair.

A.2.2 Descriptive and exploratory variables. A. Questionnaire for determining *age range*.
What is your age range?

- A1: 0-18
- A2: 19-25
- A3: 26-35
- A4: 36-50
- A5: 50-80
- A6: 80+

B. Questionnaire for determining *level of education*.
What is the highest level of school that you have completed or the highest degree you have received?

- A1: High school incomplete or less.
- A2: High school graduate or GED (includes technical / vocational training that does not award college credit)
- A3: Some college (some community college, associate's degree).
- A4: Four year college degree / bachelor's degree
- A5: Some postgraduate or professional schooling, no postgraduate degree
- A6: Postgraduate or professional degree, including master's, doctorate, medical or law degree

C. Items to measure *AI literacy*. Assessed on a seven-point Likert scale (1 = completely disagree, 7 = completely agree).

(1) I have a good knowledge in the field of *artificial intelligence.*
(2) My current employment includes working with *artificial intelligence.*
(3) I am confident interacting with *artificial intelligence.*
(4) I understand what the term *artificial intelligence* means.

D. Items to measure *Affinity to technology*. Assessed on a seven-point Likert scale (1 = completely disagree, 7 = completely agree).

(1) I like to occupy myself in greater detail with technical systems.
(2) I like testing functions of new technical systems.
(3) It is enough for me that a technical system works; I don't care about how or why. (r) [1]
(4) It is enough for me to know the basic functions of a technical system. (r)

E. Items to measure *personal experiences*. Assessed on a seven-point Likert scale (1 = completely disagree, 7 = completely agree).

(1) I have heard or had experience with a human making loan decisions for <task>.

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[1]Reverse-coded item

(2) I have heard about or had experience with an *artificial intelligence system* making loan decisions for <task>.

F. Item to measure *task stakes perception.* Assessed on a seven-point Likert scale (1 = very low stakes, 7 = very high stakes).
  (1) What are the stakes involved in a <task> loan decision-making process based on the impact that this decision has on end users' lives?

G. Open-ended questions.
  (1) Do you think the bank offers appropriate information about the decision-making process? Why? If not, what information do you think the bank should offer Kim?
  (2) Do you think that the procedure that the bank has put in place for making <task> loan decisions in a timely manner is fair? Why? If not, what would make the procedure fairer?

A.2.3   Screenshots of the measurements in the Main Study.

Indicate how much you agree or disagree with the following 4 statements.

	Completely disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Completely agree
The bank thoroughly explains how the information provided by Kim is used for making a decision.	○	○	○	○	○	○	○
The explanations regarding the home loan decision decision-making are reasonable.	○	○	○	○	○	○	○
The explanations are tailored to meet Kim's needs.	○	○	○	○	○	○	○
I understand the way the bank uses the information to make decisions.	○	○	○	○	○	○	○

Figure 2: Screenshot from the Main Study, where participants would rate their perceptions of informational fairness.

Indicate how much you agree or disagree with the following 7 statements.

	Completely disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Completely agree
Kim is able to express their views and feelings during the holiday loan decision-making process	○	○	○	○	○	○	○
Kim has influence over the decision arrived at by this process	○	○	○	○	○	○	○
The holiday loan decision-making is applied consistently	○	○	○	○	○	○	○
The holiday loan decision-making process is free of bias	○	○	○	○	○	○	○
The holiday loan decision-making process is based on accurate factors	○	○	○	○	○	○	○
Kim is able to appeal the decision arrived at by this process	○	○	○	○	○	○	○
The holiday loan decision-making process upholds ethical and moral standards	○	○	○	○	○	○	○

Figure 3: Screenshot from the Main Study, where participants would rate their perceptions of procedural fairness.

Indicate how much you agree or disagree with the following statement.

	Completely disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Completely agree
Overall the home loan decision making is fair.	○	○	○	○	○	○	○

Figure 4: Screenshot from the Main Study, where participants would rate their perceptions of overall fairness.

Figure 5: Screenshot from the Main Study, where participants would determine their age range.

Figure 6: Screenshot from the Main Study, where participants would select their level of education.

Indicate how much you agree or disagree with the following 4 statements.

	Completely disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Completely agree
I think I have a good knowledge in the field of artificial intelligence	○	○	○	○	○	○	○
My current employment includes working with artificial intelligence	○	○	○	○	○	○	○
I am confident interacting with artificial intelligence	○	○	○	○	○	○	○
I understand what the term artificial intelligence means	○	○	○	○	○	○	○

Figure 7: Screenshot from the Main Study, where participants would self-rate their AI literacy.

Indicate how much you agree or disagree with the following 4 statements.

	Completely disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Completely agree
I like to occupy myself in greater detail with technical systems (systems that include some technology: computing systems, electronic gadgets, mechanisms)	○	○	○	○	○	○	○
I like testing functions of new technical systems	○	○	○	○	○	○	○
It is enough for me that a technical system works; I don't care about how or why	○	○	○	○	○	○	○
It is enough for me to know the basic functions of a technical system	○	○	○	○	○	○	○

Figure 8: Screenshot from the Main Study, where participants would rate their affinity to technology.

Indicate how much you agree or disagree with the following 2 statements.

	Completely disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Completely agree
I have heard of or had experience with a human making decisions for home loans	○	○	○	○	○	○	○
I have heard of or had experience with an artificial intelligence making decisions for home loans	○	○	○	○	○	○	○

Figure 9: Screenshot from the Main Study, where participants would rate their experience with humans and algorithms making loan decisions.

Indicate the stakes involved in the decision.

	Very low stakes	Low stakes	Slightly low stakes	Neither high nor low stakes	Slightly high stakes	High stakes	Very high stakes
What are the stakes involved in a home loan decision-making process based on the impact that this decision has on the end user's life?	○	○	○	○	○	○	○

Figure 10: Screenshot from the Main Study, where participants would rate their perceptions toward the stakes of the task.

Do you think the bank offers appropriate information about the home loan decision-making process? Why?

What information do you think the bank should offer Kim?

Do you think that the procedure that the bank has put in place for making home loan decisions in a timely manner is fair? Why?

What would make the procedure fairer?

Figure 11: Screenshot from the Main Study, where participants would answer to four open-ended questions.