



CYBECO

Supporting Cyberinsurance from a Behavioural Choice Perspective

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox.

Date: April 2019

Abstract:

This document presents the description of all the variables contained in the dataset collected in the Experiment 2 of CYBECO project as well as its rationale and the screenshots of the experimental software.

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1 Introduction

This document presents the description of all the variables contained in the dataset collected in the Experiment 2 of CYBECO project as well as its rationale and the screenshots of the experimental software. Deliverable 6.3: Report with Findings of Experiments and Policy implications¹ of CYBECO project presents the details of the implementation of the experiment, the results obtained and its implications for the validation and potential improvement of CYBECO toolbox.

The document is structured as follows. Section 2 presents the rationale and the experimental conditions of Experiment 2. The experiment is focused in the use of the CYBECO toolbox, specifically, the experiment implements five alternative designs of the interactive output page of the CYBECO toolbox to study how these designs affect cyberinsurance decision-making. Section 3 contains the screenshots of the experimental software. Finally, section 4 lists and describes the variables collected in the dataset.

¹ <https://www.cybeco.eu/results>

2 Rationale of Experiment 2

Experiment 2 aims to test the CYBECO toolbox. The toolbox takes the form of an online calculator to guide the user through analyzing their current cybersecurity risk level and deciding the optimal cybersecurity strategy for their needs. The calculator takes the form of a multi-step online form which asks pertinent questions (e.g., SME size, characteristics, relevant threats, available security measures) and offers the best option for the SME based on the outcomes of CYBECO cyber risk management models.

In Experiment 2, participants were invited to use a mock-up version of the cyber-risk analysis tool for SMEs included in the CYBECO toolbox and based in the CYBECO model. Concretely, participants were assigned an initial endowment that could be used to buy a combination of insurance and protection measures. For this task, subject counted with the help of the output page of the CYBECO toolbox to provide information on the results of the cyber-risk analysis and to guide them during the purchase of cyberinsurance and protection measures. The selected cybersecurity strategy and the fact of suffering or not a random cyberattack determined the payoff to be received at the end of the experiment. The experimental session included pre- and post- questionnaires to provide classification information and evaluate the usability of the output page of the CYBECO toolbox. Experiment 2 was run under five experimental conditions or treatments, consisting in five different designs of the output page of the CYBECO toolbox. The five designs are presented in detail in the next section.

Since the aim of experiment 2 is to test the effectivity and usability of the CYBECO toolbox, the selection of the participants become critical. For this reason, the sample of 2,000 participants in experiment 2 was recruited among potential users of the tool from SMEs or autonomous workers (entrepreneurs, freelancers, etc.). Participants were required to work in positions related to decision-making in the areas of cybersecurity and insurance, from a technical, managerial or purchases departments of SMEs. As described in detail in subsection 3.2.4, this challenging recruitment process was successful, since half of the participants have purchased protection measures for their SMEs and forth of them do have even contracted cyberinsurance policies in the past. Since the condition of having already purchased was not explicitly required, we can consider the participants in the sample as potential users of the CYBECO toolbox.

Experiment 2 was run with a total sample of 2.078 subjects from four different countries (Germany, Poland, Spain and UK). The fieldwork of the experiment started on September 2018 and ended in October 2018 in the four countries. The distribution by age and gender reflects Eurostat's data from the 2017 survey on ICT, Table 1.

	<i>Country</i>				
	Germany	Spain	Poland	UK	<i>Total</i>
Final sample	520	503	534	521	2078

Table 1. Distribution of the participants by country.

2.1 Experimental Conditions

This experiment is focused in the potential framings of the output page of the CYBECO toolbox. This interactive screen presents the costs and impacts of the five best cybersecurity strategies for the subject, according with the CYBECO model. Using the functionalities of this page, subjects are able to analyse in detail the five option and, at a latter step of the experiment, to purchase the protection and insurance strategies that they decide (despite of the recommendations of the CYBECO toolbox).

The experiment considers the following five framings for the interactive risk analysis dashboard of the toolbox:

- *Treatment 1 (Expected – Losses)*. This treatment, shown in Figure 1, presents the risk analysis in terms of the expected values of the losses to be faced by the subject when applying each of the five cybersecurity strategies. The expected value is computed using the probabilities of the two alternative scenarios (suffering or not the cyberattack) and the monetary losses to be suffered in each scenario (prices of protection and insurance products, losses in the commercial value of the data and the potential compensation of the insurance policy taken by the subjects). This framing is the original proposal presented in the CYBECO toolbox.

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

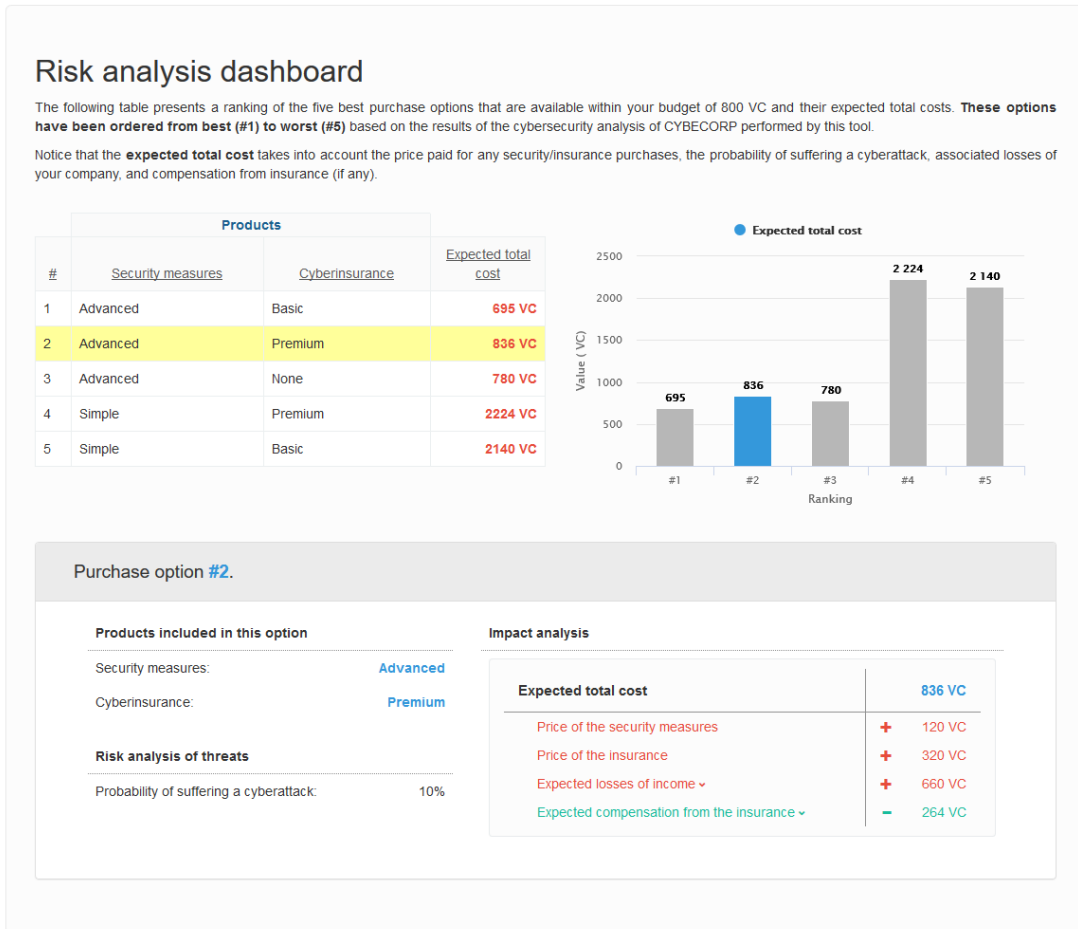


Figure 1. Treatment 1 (Expected - Losses)

- *Treatment 2 (Expected – Losses - Salience)*. The information is presented here with the same framing than in treatment 1. However, the difference is that treatment 2 includes a high salience message communicating that the first option in the ranking is recommended by the cybersecurity experts and a click for direct purchase of the recommended option. The framing of treatment 2 is presented in Figure 2.

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

Risk analysis dashboard

The following table presents a ranking of the five best purchase options that are available within your budget of 800 VC and their expected total costs. **These options have been ordered from best (#1) to worst (#5)** based on the results of the cybersecurity analysis of CYBECORP performed by this tool.

Notice that the **expected total cost** takes into account the price paid for any security/insurance purchases, the probability of suffering a cyberattack, associated losses of your company, and compensation from insurance (if any).

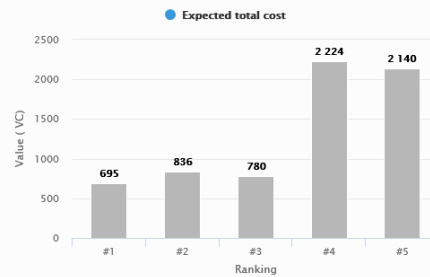


Based on the results of the cybersecurity analysis performed by this tool, our experts recommend that you purchase the **Advanced security measures** and the **Basic cyberinsurance**.

You can purchase the recommended products by clicking the button below.

[Buy now](#)

#	Products		Expected total cost
	Security measures	Cyberinsurance	
1	Advanced	Basic	695 VC
2	Advanced	Premium	836 VC
3	Advanced	None	780 VC
4	Simple	Premium	2224 VC
5	Simple	Basic	2140 VC



Purchase option #2.

Products included in this option

Security measures: **Advanced**
 Cyberinsurance: **Premium**

Risk analysis of threats

Probability of suffering a cyberattack: 10%

Impact analysis

Expected total cost		836 VC
Price of the security measures	+	120 VC
Price of the insurance	+	320 VC
Expected losses of income	-	660 VC
Expected compensation from the insurance	-	264 VC

Figure 2. Treatment 2 (Expected – Losses – Saliency)

- *Treatment 3 (Expected – Gains)*. Although the information is presented again using expected values, the output does not provide information of the expected losses to be suffered by the subjects but on the total income that the company would obtain using each of the analysis cybersecurity strategies. This treatment can be compared to treatment 1 to analyze the impact of loss aversion in subject cybersecurity decision-making. The output under this framing is shown in Figure 3.

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

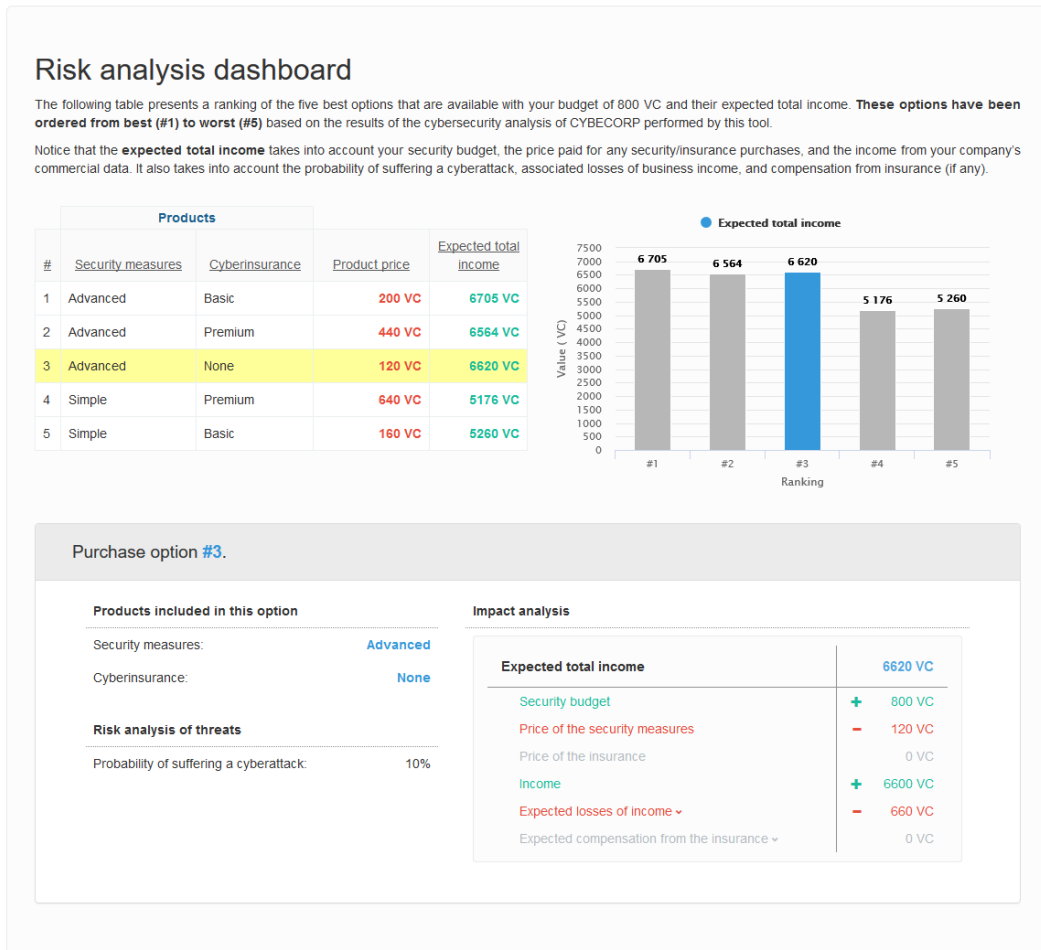


Figure 3. Treatment 3 (Expected – Gains)

- Treatment 4 (Scenario – Losses).** This treatment shares with treatment 1 the feature that the information is presented frames as losses. However, there is a key difference given by the fact that information is not presented as expected values but disaggregated for the scenarios of suffering and not suffering the cyberattack. The output page for this treatment is presented in Figure 4. It must be highlighted that in this treatment the subject is provided with all the information required to determine is optimal cybersecurity strategy in terms of her or his utility function and risk attitude. In treatments 1 to 3, such information was not available and the subject is required to decide using only the expected values.

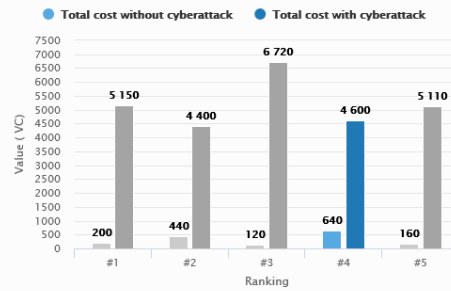
Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

Risk analysis dashboard

The following table presents a ranking of the five best purchase options that are available within your budget of 800 VC and their total costs in case of suffering a cyberattack or not. **These options have been ordered from best (#1) to worst (#5)** based on the results of the cybersecurity analysis of CYBECORP performed by this tool.

Notice that the **total cost** takes into account the price paid for any security/insurance purchases. Total cost is shown in the case of suffering a cyberattack or not. In the instance of a cyberattack, total cost also takes into account the losses of business income and compensation from insurance (if any).

#	Products		Total cost	
	Security measures	Cyberinsurance	No cyberattack	Cyberattack
1	Advanced	Basic	200 VC	5150 VC
2	Advanced	Premium	440 VC	4400 VC
3	Advanced	None	120 VC	6720 VC
4	Simple	Premium	640 VC	4600 VC
5	Simple	Basic	160 VC	5110 VC



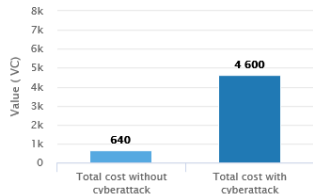
Purchase option #4

Products included in this option

Security measures: **Basic**
 Cyber-insurance: **Premium**

Risk analysis of threats

Probability of suffering a cyber-attack: 40%
 Probability of not suffering a cyber-attack: 60%



Impact analysis

Total cost without cyberattack	640 VC
Price of the security measures	0 VC
Price of the insurance	+ 640 VC
Losses of income	0 VC
Compensation from the insurance	0 VC

Total cost with cyberattack	4600 VC
Price of the security measures	0 VC
Price of the insurance	+ 640 VC
Losses of income	+ 6600 VC
Compensation from the insurance	- 2640 VC

Figure 4. Treatment 4 (Scenarios – Losses)

- *Treatment 5 (Scenarios – Gains)*. This output page in this treatment, shown in Figure 5, is like that of treatment 2, with the difference that the information is framed as gains instead of as losses.

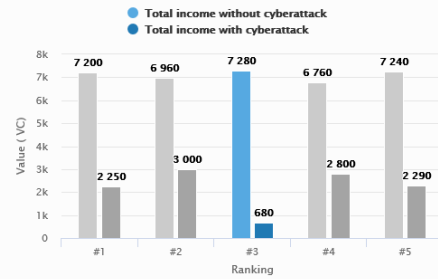
Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

Risk analysis dashboard

The following table presents a ranking of the options that are available with your budget of 800 VC and the total income in case of suffering a cyberattack or not. **These options have been ordered from best (#1) to worst (#5)** based on the results of the cybersecurity analysis of CYBECORP performed by this tool.

Notice that the **total income** takes into account your security budget, the price paid for any security/insurance purchases, the income from your business's commercial data. Total income is shown in the case of suffering a cyberattack or not. In the instance of a cyberattack, total income also takes into account associated losses of business income and compensation from insurance (if any).

#	Products		Total income	
	Security measures	Cyberinsurance	No cyberattack	Cyberattack
1	Advanced	Basic	7200 VC	2250 VC
2	Advanced	Premium	6960 VC	3000 VC
3	Advanced	None	7280 VC	680 VC
4	Simple	Premium	6760 VC	2800 VC
5	Simple	Basic	7240 VC	2290 VC



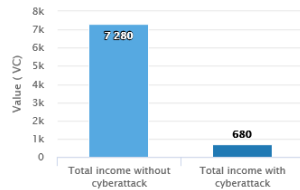
Purchase option #3

Products included in this option

Security measures: **Advanced**
 Cyber-insurance: **None**

Risk analysis of threats

Probability of suffering a cyber-attack: 10%
 Probability of not suffering a cyber-attack: 90%



Impact analysis

Total income without cyberattack	7280 VC
Security budget	+ 800 VC
Price of the security measures	- 120 VC
Price of the insurance	0 VC
Income	+ 6600 VC
Losses of income	0 VC
Compensation from the insurance	0 VC

Total income with cyberattack	680 VC
Budget	+ 800 VC
Price of the security measures	- 120 VC
Price of the insurance	0 VC
Assets value	+ 6600 VC
Losses of income	- 6600 VC
Compensation from the insurance	0 VC

Figure 5. Treatment 5 (Scenarios – Gains)

3 Screenshots of the experimental software

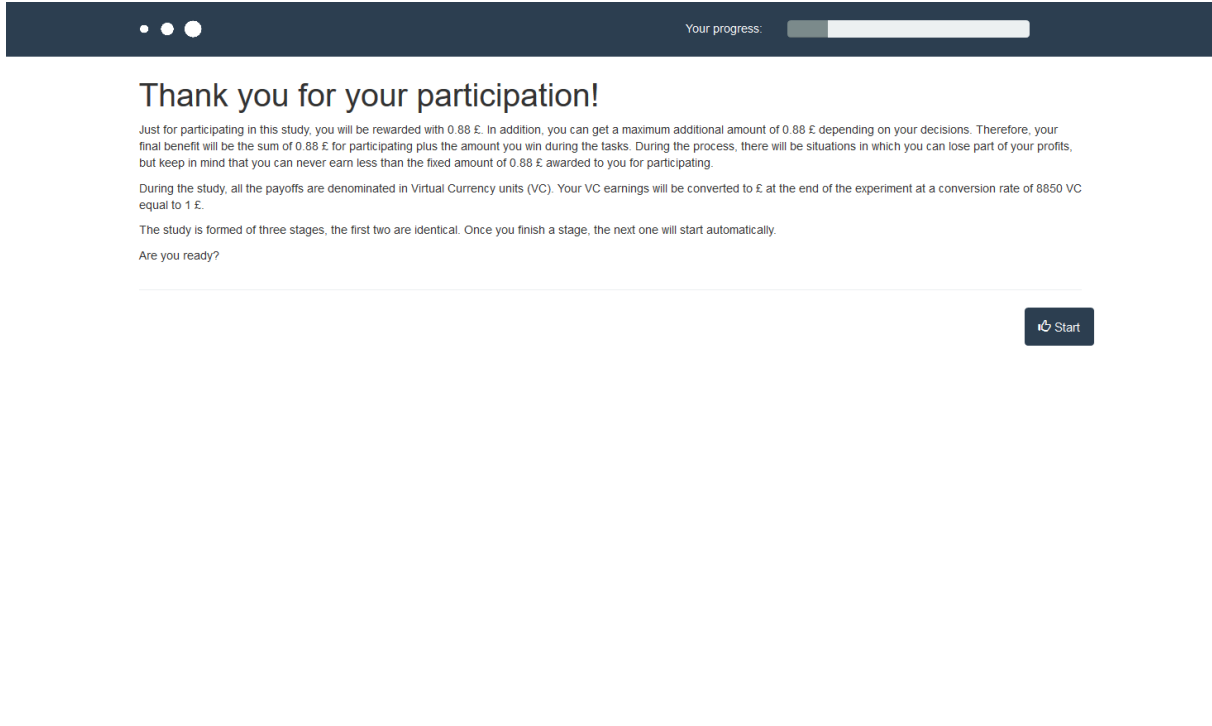


Figure 6. Welcome page

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Before enjoying the experience, we would like to know more about you

1. What is your year of birth?

- Select -

2. Gender

- Select -

3. What is the highest level of education you have completed?

0-11 years of education

12 years of education (high school diploma)

Some years of university (not completed)

University degree (BA, BS)

Post-graduate degree (MA, MS, JD, MD, PhD, etc)

4. Which of the following categories best describes the industry you primarily work in (regardless of your actual position)?

- Select -

5. Which of the following best describes your role in industry?

- Select -

6. Employment history (You can select more than one option)

Over 1 years experience of using IT systems

Over 1 years experience in a management position

Over 1 years experience in a role with responsibility for purchasing

Over 1 years experience in a cybersecurity role

None of the above

7. Did you ever buy protection measures (antivirus, firewall, etc.) for you or your company?

Yes

No

8. Did you ever buy cyberinsurance products for you or your company?

Yes

No

Continue

Figure 7. Socio-demographic questionnaire

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• • • Your progress:

Stage 1

You are the cybersecurity manager of a small business, called CYBECORP. You are aware that **there is a computer virus going around the Internet, that may affect your company**. You know that 60% of companies like yours have suffered this virus attack in the last week.

We will now ask you to make some decisions that will affect the cybersecurity of CYBECORP.

Read the following instructions in detail and press "Continue" when you are ready.

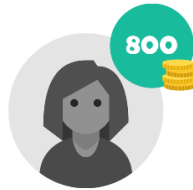
Note: You do not need to have any knowledge about computer systems or cybersecurity to complete the study. There are no right or wrong answers please just answer honestly. Whatever the result, you are guaranteed a minimum of the fixed participation rate at the end of the study.

1. Initial State

Your initial state is the following:



The income that CYBECORP obtains from its commercial data is 6600 VC



You have a budget of 800 VC to buy security measures



The probability that CYBECORP is randomly affected by the virus is 60%

2. Risk analysis tool

On the next page, you will be given the opportunity to use our Risk Analysis Tool to help you to decide the cyber-protection strategy for your company.

3. Purchase of security measures

After you have used the Risk Analysis Tool, you will have the opportunity to spend some of your budget on purchasing security measures and/or insurance against cyber-attacks.

4. Results

Finally, CYBECORP may suffer a cyberattack (the probability of which is affected by your decisions) and you will be presented with your resulting payoff. There are two possible scenarios:

1)



CYBECORP **does not suffer any cyberattack** and maintains the income obtained from its commercial data. Therefore, your payout will be 6600 VC of the CYBECORP income plus what you have left of your budget.

2)



CYBECORP **suffers a cyberattack** and loses all income from its commercial data. Therefore, your payout will be what you have left of your budget plus the amount you have insured (if you chose to buy insurance).

Continue



Figure 8. Stage 1 instructions

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Your progress: ?

Risk Analysis Tool

As previously presented, CYBECORP is a small business which obtains a profit of 6600 VC from its commercial data. You know that 60% of companies like yours have suffered this virus attack in the last week. As cyber-security manager, you have a budget of 800 VC to purchase any of the following cyber-protection measures:

Measures	Product	Description	Cost
 Security measures Security measures are computer softwares used to prevent, detect and remove malicious software	Simple	Reduces the probability of suffering the attack from 60% to 40%.	0 VC
	Advanced	Reduces the probability of suffering the attack from 60% to 10%. In addition, if you buy our Advanced security measures you will have a 50% discount on the purchase of a cyberinsurance.	120 VC
 Cyberinsurance Cyberinsurance is an insurance product used to protect businesses from Internet-based risks	None	Covers 0 VC of lost profits in case of attack.	0 VC
	Basic	Covers 1650 VC of lost profits in case of attack.	160 VC
	Premium	Covers 3300 VC of lost profits in case of attack.	640 VC

Our Risk Analysis Tool analyses the impact of the cyberattack for each of the possible combinations of security measures and insurance products. It produces a dashboard with the analysis of the five best options according to some parameters of companies that are similar to CYBECORP. This information can help you to make better purchase decisions.

You can access the Risk Analysis Tool by clicking in the bottom "Generate Risk Analysis".

Note: You will be able to reread this instructions at any point by pressing the "Instructions" button on the top right.

Generate Risk Analysis

Figure 9. Risk analysis tool explanation

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Your progress: ?

Risk analysis dashboard

The following table presents a ranking of the five best purchase options that are available within your budget of 800 VC and their expected total costs. **These options have been ordered from best (#1) to worst (#5)** based on the results of the cybersecurity analysis of CYBECORP performed by this tool.

Notice that the **expected total cost** takes into account the price paid for any security/insurance purchases, the probability of suffering a cyberattack, associated losses of your company, and compensation from insurance (if any).

Products			
#	Security measures	Cyberinsurance	Expected total cost
1	Advanced	Basic	695 VC
2	Advanced	Premium	836 VC
3	Advanced	None	780 VC
4	Simple	Premium	2224 VC
5	Simple	Basic	2140 VC



Purchase option #2.

Products included in this option		Impact analysis											
Security measures:	Advanced	<table border="1" style="width: 100%;"> <thead> <tr> <th>Expected total cost</th> <th>836 VC</th> </tr> </thead> <tbody> <tr> <td>Price of the security measures</td> <td>+ 120 VC</td> </tr> <tr> <td>Price of the insurance</td> <td>+ 320 VC</td> </tr> <tr> <td>Expected losses of income</td> <td>+ 660 VC</td> </tr> <tr> <td>Expected compensation from the insurance</td> <td>- 264 VC</td> </tr> </tbody> </table>		Expected total cost	836 VC	Price of the security measures	+ 120 VC	Price of the insurance	+ 320 VC	Expected losses of income	+ 660 VC	Expected compensation from the insurance	- 264 VC
Expected total cost	836 VC												
Price of the security measures	+ 120 VC												
Price of the insurance	+ 320 VC												
Expected losses of income	+ 660 VC												
Expected compensation from the insurance	- 264 VC												
Cyberinsurance:	Premium												
Risk analysis of threats													
Probability of suffering a cyberattack:	10%												

Keep in mind that once you continue you will not be able to go back.

[Close the tool and Continue](#)

Figure 10. Treatment 1 - Risk analysis tool

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox



Risk analysis dashboard

The following table presents a ranking of the five best purchase options that are available within your budget of 800 VC and their expected total costs. **These options have been ordered from best (#1) to worst (#5)** based on the results of the cybersecurity analysis of CYBECORP performed by this tool.

Notice that the **expected total cost** takes into account the price paid for any security/insurance purchases, the probability of suffering a cyberattack, associated losses of your company, and compensation from insurance (if any).

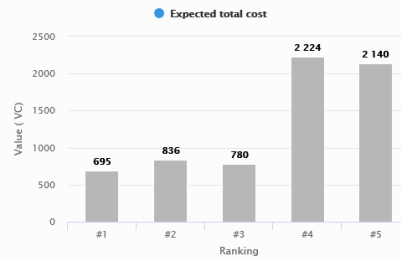


Based on the results of the cybersecurity analysis performed by this tool, our experts recommend that you purchase the **Advanced security measures** and the **Basic cyberinsurance**.

You can purchase the recommended products by clicking the button below.

Buy now 

Products			
#	Security measures	Cyberinsurance	Expected total cost
1	Advanced	Basic	695 VC
2	Advanced	Premium	836 VC
3	Advanced	None	780 VC
4	Simple	Premium	2224 VC
5	Simple	Basic	2140 VC



Purchase option #2.

Products included in this option

Security measures: **Advanced**
 Cyberinsurance: **Premium**

Risk analysis of threats

Probability of suffering a cyberattack: 10%

Impact analysis

Expected total cost	836 VC
Price of the security measures	+ 120 VC
Price of the insurance	+ 320 VC
Expected losses of income	+ 660 VC
Expected compensation from the insurance	- 264 VC

Keep in mind that once you continue you will not be able to go back.

Close the tool and Continue

Figure 11. Treatment 2 - Risk analysis tool

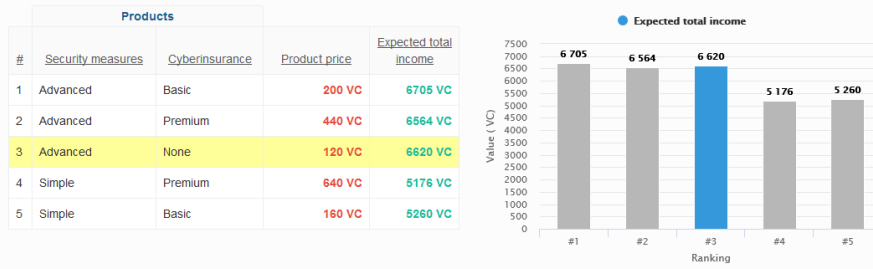
Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

Your progress: ?

Risk analysis dashboard

The following table presents a ranking of the five best options that are available with your budget of 800 VC and their expected total income. **These options have been ordered from best (#1) to worst (#5)** based on the results of the cybersecurity analysis of CYBECORP performed by this tool.

Notice that the **expected total income** takes into account your security budget, the price paid for any security/insurance purchases, and the income from your company's commercial data. It also takes into account the probability of suffering a cyberattack, associated losses of business income, and compensation from insurance (if any).



Purchase option #3.

Products included in this option

Security measures: **Advanced**

Cyberinsurance: **None**

Risk analysis of threats

Probability of suffering a cyberattack: 10%

Impact analysis

Expected total income	6620 VC
Security budget	+ 800 VC
Price of the security measures	- 120 VC
Price of the insurance	0 VC
Income	+ 6600 VC
Expected losses of income	- 660 VC
Expected compensation from the insurance	0 VC

Keep in mind that once you continue you will not be able to go back.

[Close the tool and Continue](#)

Figure 12. Treatment 3 - Risk analysis tool

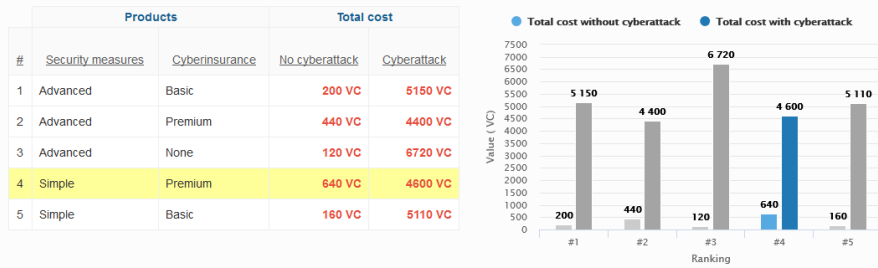
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Your progress: ?

Risk analysis dashboard

The following table presents a ranking of the five best purchase options that are available within your budget of 800 VC and their total costs in case of suffering a cyberattack or not. **These options have been ordered from best (#1) to worst (#5)** based on the results of the cybersecurity analysis of CYBECORP performed by this tool.

Notice that the **total cost** takes into account the price paid for any security/insurance purchases. Total cost is shown in the case of suffering a cyberattack or not. In the instance of a cyberattack, total cost also takes into account the losses of business income and compensation from insurance (if any).



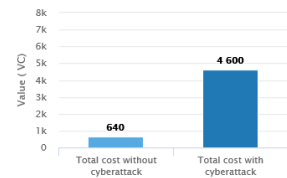
Purchase option #4

Products included in this option

Security measures: **Basic**
 Cyber-insurance: **Premium**

Risk analysis of threats

Probability of suffering a cyber-attack: 40%
 Probability of not suffering a cyber-attack: 60%



Impact analysis

Total cost without cyberattack		640 VC
Price of the security measures		0 VC
Price of the insurance	+	640 VC
Losses of income		0 VC
Compensation from the insurance		0 VC

Total cost with cyberattack		4600 VC
Price of the security measures		0 VC
Price of the insurance	+	640 VC
Losses of income	+	6600 VC
Compensation from the insurance	-	2640 VC

Keep in mind that once you continue you will not be able to go back.

[Close the tool and Continue](#)

Figure 13. Treatment 4 - Risk analysis tool

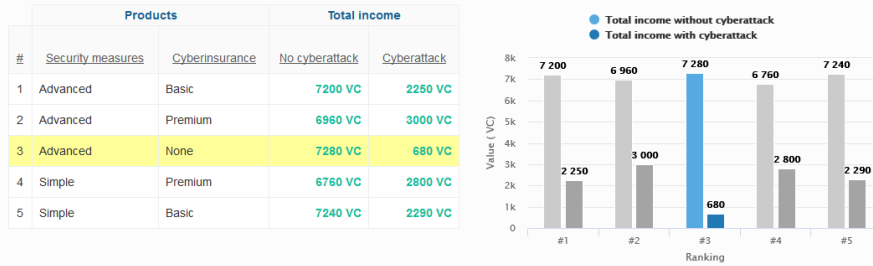
Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

Your progress: ?

Risk analysis dashboard

The following table presents a ranking of the options that are available with your budget of 800 VC and the total income in case of suffering a cyberattack or not. **These options have been ordered from best (#1) to worst (#5)** based on the results of the cybersecurity analysis of CYBECORP performed by this tool.

Notice that the **total income** takes into account your security budget, the price paid for any security/insurance purchases, the income from your business's commercial data. Total income is shown in the case of suffering a cyberattack or not. In the instance of a cyberattack, total income also takes into account associated losses of business income and compensation from insurance (if any).



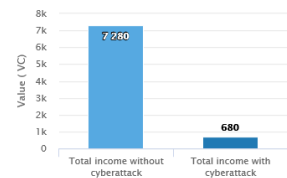
Purchase option #3

Products included in this option

Security measures: Advanced
 Cyber-insurance: None

Risk analysis of threats

Probability of suffering a cyber-attack: 10%
 Probability of not suffering a cyber-attack: 90%



Impact analysis

Total income without cyberattack		7280 VC
Security budget	+	800 VC
Price of the security measures	-	120 VC
Price of the insurance		0 VC
Income	+	6600 VC
Losses of income		0 VC
Compensation from the insurance		0 VC

Total income with cyberattack		680 VC
Budget	+	800 VC
Price of the security measures	-	120 VC
Price of the insurance		0 VC
Assets value	+	6600 VC
Losses of income	-	6600 VC
Compensation from the insurance		0 VC

Keep in mind that once you continue you will not be able to go back.

Close the tool and Continue

Figure 14. Treatment 5 - Risk analysis tool

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox



Your progress: 

Cybersecurity shop

Welcome to our Cybersecurity shop! Below, we present the security measures you can buy for CYBECORP. Select the measures you want to buy and press "Continue." Remember that you have a budget of **800 VC** and keep in mind that once you press "Continue" you will not be able to go back. You can reread the instructions at any point by pressing the "Instructions" button on the top right.

Security measures

Security measures are computer softwares used to prevent, detect and remove malicious software:

Simple security measures		Advanced security measures	
			
Simple security measures costs 0 VC and the probability of suffering the attack is 40%		Advanced security measures costs 120 VC and the probability of suffering the attack is 10%	
Cost		Cost	
0 VC		120 VC	
Attack probability		Attack probability	
40%		10%	

In addition, if you buy our Advanced security measures you will have a 50% discount on the purchase of a cyberinsurance.




Which one do you want to buy?

Simple security measures

Advanced security measures

Cyberinsurance

Cyberinsurance is an insurance product used to protect businesses from Internet-based risks. We offer you three options with different level of coverage:

No insurance		Basic insurance		Premium insurance	
					
Opting for no insurance costs 0 VC and covers 0 VC of lost profits in case of attack		The "Basic insurance" costs 160 VC and covers 1650 VC of lost profits in case of attack		The "Premium insurance" costs 640 VC and covers 3300 VC of lost profits in case of attack	
Cost		Cost		Cost	
0 VC		160 VC		640 VC	
Coverage		Coverage		Coverage	
0 VC		1650 VC		3300 VC	

Which one do you want to buy?

No insurance

Basic insurance

Premium insurance

Continue

Figure 15. Cybersecurity shop

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

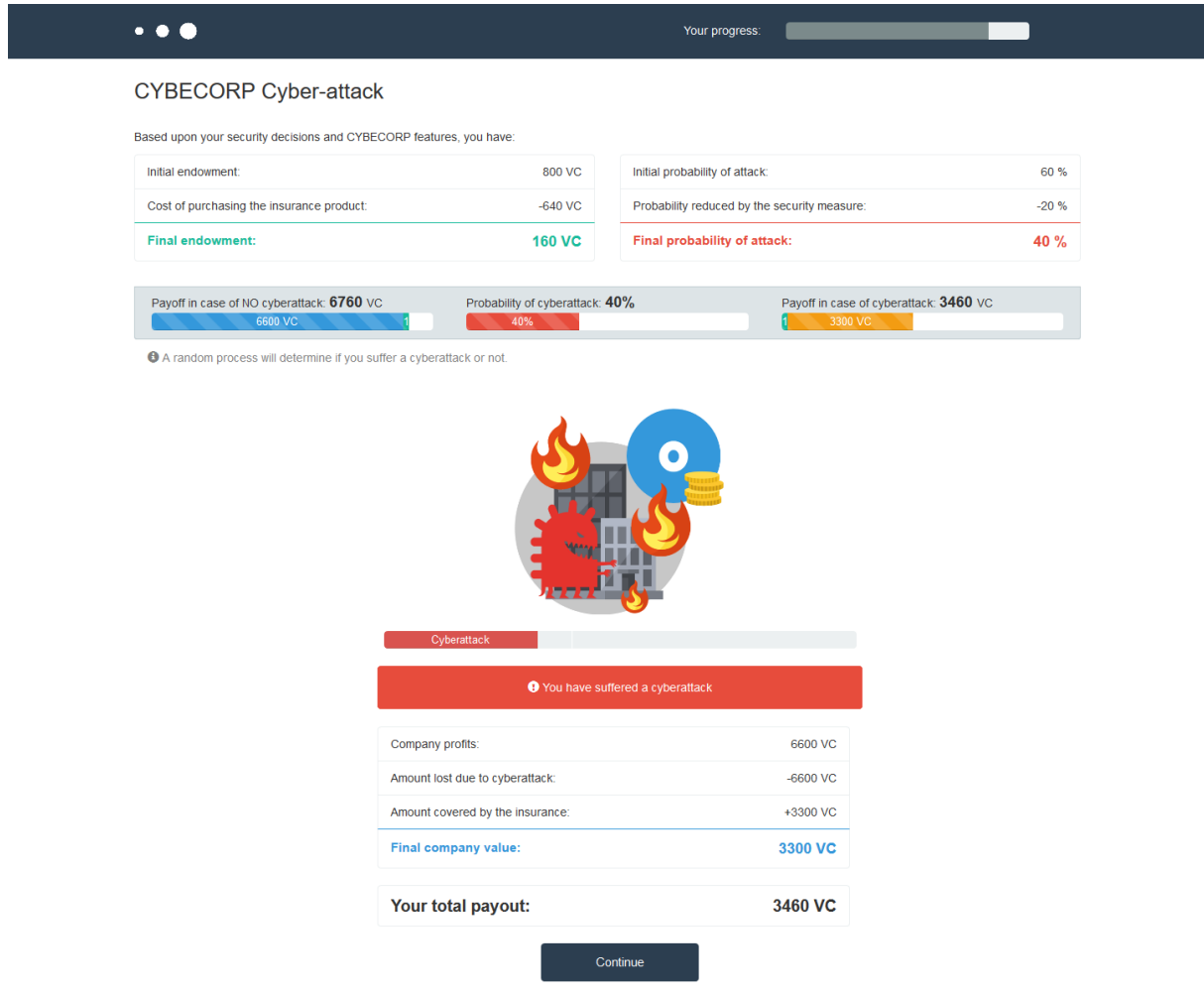


Figure 16. Cyberattack simulation

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

Your progress:

Before continuing, we would like you to answer some questions about your decisions

Why do you selected the option that you purchase from our cybersecurity shop?

- It guaranteed the highest coverage in the case of an attack
- It was the cheapest
- It guaranteed the maximum protection against a cyberattack
- It was the first in the ranking
- It was the option recommended by the experts in cybersecurity
- I selected an option at random

Our Risk Analysis Tool presents a ranking of the five best options that are available with your budget:

Do you consider that the terms and concepts that appear in this risk analysis dashboard are clear and easy to understand?

Very unclear and difficult to understand...
1
2
3
4
5
6
7
... Very clear and easy to understand

Do you remember which of the following options was the first one in the ranking provided by the tool?

- Simple security measures & No insurance
- Simple security measures & Basic insurance
- Simple security measures & Premium insurance
- Advance security measures & No insurance
- Advance security measures & Basic insurance
- Advance security measures & Premium insurance

Did you buy the first option of the ranking?

- Yes
- No
- I don't know

Please, indicate the degree to which you agree or disagree with the following statements:

How confident are you in the option you have chosen? 0% Not at all confident 100% Confident

How much do you trust that the toolbox will suggest the best option for you? 0% No trust 100% Complete trust

Please, indicate the degree to which you agree or disagree with the following statements:

If available, how likely would you be to use this toolbox in the future?

Not at all likely...
1
2
3
4
5
6
7
... Highly likely

The toolbox's capabilities meet my requirements

Do not meet my requirements at all...
1
2
3
4
5
6
7
... Meet all of my requirements

The toolbox is easy to use

Very difficult to use...
1
2
3
4
5
6
7
... Very easy to use

Continue

Figure 17. Usability questionnaire

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox



Stage 2

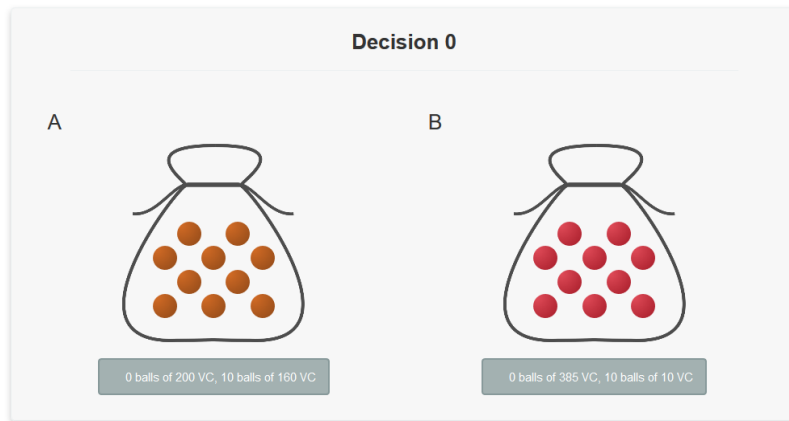
Finally, to increase your earnings, we are going to play eleven rounds of a quick and simple game. In each round, you will see a picture with two bags (Bag A and Bag B) with 10 balls in each bag. The balls have four different values:



In each round, we will ask you to select one of these two bags. After completing the eleven decisions:

1. One of the 11 rounds of the game will be picked at random
2. A ball will be drawn at random **from the bag that you have actually chosen** in this round
3. The value of this ball will be added to your final payment

Please choose Bag A or Bag B for each decision below.



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Figure 18. Stage 2: Holt & Laury



Stage 2 - Results

As mentioned before, the first random number will determine which of the eleven decisions will be used. All of them have the same probability to be picked.

Click the button to start the draw!

Selected decision

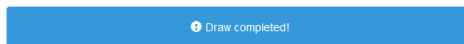
5

Your choice for Decision 5

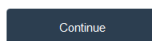
	Bag A	Bag B
Decision 5	<input type="radio"/> 5 balls of 200 VC, 5 balls of 160 VC	<input checked="" type="radio"/> 5 balls of 385 VC, 5 balls of 10 VC

i You have selected the bag B for decision 5 in the previous screen. So, now you have 5 balls with a value of 385 VC and 5 balls with a 10 VC.

When you click the button, one of the balls will be randomly selected and this will be the number of additional VC you will earn.



Your earnings: 10 VC



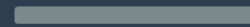
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Figure 19. Stage 2 results

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Your progress:



Thank you!

Thank you for taking the time to complete this study. We truly value the information you have provided.

The total profit you earned for all 2 stages are shown below:

Stage 1	3460 VC
Stage 2	10 VC
Total	3470 VC

Your VC earnings are converted to £ at a conversion rate of 8850 VC equal to 1 £, therefore, your final payoff in £ is:

3470 VC	0.39 £
Fixed part	0.88 £
Total	1.27 £



Please press "Finish" to complete the process

Finish

Figure 21. End page

4 Description of the variables in the dataset

The description of the variables included in the dataset collected during the Experiment 1 is presented in the tables of the following subsections.

4.1 Subject

<i>Variable</i>	<i>Description</i>
<i>Subject</i>	Subject ID
<i>Country</i>	Subjects' country DE: Germany ES: Spain UK: United Kingdom PL: Poland
<i>Treatment</i>	Treatment (see Section 2.1) 1: Expected – Losses 2: Expected – Losses – Salience 3: Expected – Gains 4: Scenario – Losses 5: Scenarios – Gains

4.2 Socio-demographic questionnaire

<i>A1</i>	<i>What is your year of birth?</i>
<i>A2</i>	Gender 1: Male 2: Female
<i>A3</i>	What is the highest level of education you have completed? 1: 0 -11 years of education 2: 12 years of education (high school diploma) 3: Some years of university (not completed) 4: University degree (BA, BS) 5: Post-graduate degree (MA, MS, JD, MD, PhD, etc) 6: Employment situation Self-employed 7: Public/Private worker 8: Unemployed

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A4

- 9: Housewife/Househusband
- 10: Student
- 11: Retired
- 12: Other (rent perceiver, public or private aid)

Which of the following categories best describes the industry you primarily work in (regardless of your actual position)?

- 1: Software
- 2: Telecommunications
- 3: Information Services and Data Processing
- 4: Computer and Electronics Manufacturing
- 5: Finance and Insurance
- 6: Agriculture, Forestry, Fishing and Hunting
- 7: Utilities
- 8: Wholesale
- 9: Transportation and Warehousing
- 10: Broadcasting
- 11: Other Information Industry
- 12: Real Estate, Rental and Leasing
- 13: Primary/Secondary (K-12) Education
- 14: Health Care and Social Assistance
- 15: Hotel and Food Services
- 16: Legal Services
- 17: Homemaker
- 18: Religious
- 19: Mining
- 20: Construction
- 21: Other Manufacturing
- 22: Retail
- 23: Publishing
- 24: College, University, and Adult Education
- 25: Other Education Industry
- 26: Arts, Entertainment, and Recreation
- 27: Government and Public Administration
- 28: Scientific or Technical Services
- 29: Military
- 30: Other Industry

A5

Which of the following best describes your role in industry?

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	1: Upper Management 2: Middle Management 3: Junior Management 4: Administrative Staff 5: Support Staff 6: Student 7: Trained Professional 8: Skilled Laborer 9: Consultant 10: Temporary Employee 11: Researcher 12: Self-employed/Partner 13: Other
A6a	Employment history - Over 1 years experience of using IT systems 0: No 1: Yes
A6b	Employment history - Over 1 years experience in a management position 0: No 1: Yes
A6c	Employment history - Over 1 years experience in a role with responsibility for purchasing 0: No 1: Yes
A6d	Employment history - Over 1 years experience in a cybersecurity role 0: No 1: Yes
A6e	Employment history - None of the above 0: No 1: Yes
A7	Did you ever buy protection measures (antivirus, firewall, etc.) for you or your company? 0: No 1: Yes
A8	Did you ever buy cyberinsurance products for you or your company? 0: No

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1: Yes

4.3 Phase 1

Toolbox interaction and purchase decisions.

Direct *Press the toolbox button of direct purchase²*
0: Basic security measures
1: Advance security measures

<i>Clicks</i>	Sequence of toolbox rows clicked by the subject, separated by “,”
<i>SecurityMeasures</i>	Security measures purchased by the subject 1: Simple security measures 2: Advance security measures
<i>Insurance</i>	Cyberinsurace contracted by the subject 1: None cyberinsurance 2: Basic cyberinsurance 3: Premium cyberinsurance
<i>Attack</i>	If subject’s company suffers a cyberattack 0: No 1: Yes

4.4 Usability test

U01a *Why do you selected the option that you purchase from our cybersecurity shop?*
It guaranteed the highest coverage in the case of an attack
 0: No
 1: Yes

U01b *Why do you selected the option that you purchase from our cybersecurity shop?*
It was the cheapest
 0: No
 1: Yes

U01c *Why do you selected the option that you purchase from our cybersecurity shop?*

² Only available in Treatment 2.

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	<p>It guaranteed the maximum protection against a cyberattack</p> <p>0: No 1: Yes</p>
U01d	<p>Why do you selected the option that you purchase from our cybersecurity shop?</p> <p>It was the first in the ranking</p> <p>0: No 1: Yes</p>
U01e	<p>Why do you selected the option that you purchase from our cybersecurity shop?</p> <p>It was the option recommended by the experts in cybersecurity</p> <p>0: No 1: Yes</p>
U01f	<p>Why do you selected the option that you purchase from our cybersecurity shop?</p> <p>I selected an option at random</p> <p>0: No 1: Yes</p>
U02	<p>Do you consider that the terms and concepts that appear in this risk analysis dashboard are clear and easy to understand?</p> <p>Very unclear and difficult to understand 1 2 3 4 5 6 7 Very clear and easy to understand</p>
U03	<p>Do you remember which of the following options was the first one in the ranking provided by the tool?</p> <p>1: Simple security measures & No insurance 2: Simple security measures & Basic insurance 3: Simple security measures & Premium insurance 4: Advance security measures & No insurance 5: Advance security measures & Basic insurance 6: Advance security measures & Premium insurance</p>
U04	<p>Did you buy the first option of the ranking?</p> <p>1: Yes 2: No 3: I don't know</p>
U05a	<p>Why did you not select the first option in the ranking provided by the tool? (If U04 = "No")</p> <p>Options were ranked with no special criterion</p> <p>0: No</p>

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<p><i>U05b</i></p>	<p>1: Yes</p> <p>Why did you not select the first option in the ranking provided by the tool? (If U04 = "No")</p> <p>The first option was too expensive</p> <p>0: No</p> <p>1: Yes</p>
<p><i>U05c</i></p>	<p>Why did you not select the first option in the ranking provided by the tool? (If U04 = "No")</p> <p>The insurance in first option did not provide enough coverage</p> <p>0: No</p> <p>1: Yes</p>
<p><i>U05d</i></p>	<p>Why did you not select the first option in the ranking provided by the tool? (If U04 = "No")</p> <p>The protection measures in the first option were not safe enough</p> <p>0: No</p> <p>1: Yes</p>
<p><i>U05e</i></p>	<p>Why did you not select the first option in the ranking provided by the tool? (If U04 = "No")</p> <p>I do not understand the criterion of the ranking</p> <p>0: No</p> <p>1: Yes</p>
<p><i>U06</i></p>	<p>How confident are you in the option you have chosen?</p> <p>Not at all confident 0% 100% Confident</p>
<p><i>U07</i></p>	<p>How much do you trust that the toolbox will suggest the best option for you?</p> <p>No trust 0% 100% Complete trust</p>
<p><i>U08</i></p>	<p>If available, how likely would you be to use this toolbox in the future?</p> <p>Not at all likely 1 2 3 4 5 6 7 Highly likely</p>
<p><i>U09</i></p>	<p>The toolbox's capabilities meet my requirements</p> <p>Do not meet my requirements at all 1 2 3 4 5 6 7 Meet all of my requirements</p>
<p><i>U10</i></p>	<p>The toolbox is easy to use</p> <p>Very difficult to use 1 2 3 4 5 6 7 Very easy to use</p>

Codebook - Experiment 2: Behavioural insights of CYBECO toolbox

4.5 Phase 2

Holt & Laury risk aversion questionnaire.

Decision 0
1: Bag A – 0 balls of 200VC, 10 balls of 160VC
Risk0 2: Bag B – 0 balls of 385VC, 10 balls of 10VC

Decision 1
1: Bag A – 1 balls of 200VC, 9 balls of 160VC
Risk1 2: Bag B – 1 balls of 385VC, 9 balls of 10VC

Decision 2
1: Bag A – 2 balls of 200VC, 8 balls of 160VC
Risk2 2: Bag B – 2 balls of 385VC, 8 balls of 10VC

Decision 3
1: Bag A – 3 balls of 200VC, 7 balls of 160VC
Risk3 2: Bag B – 3 balls of 385VC, 7 balls of 10VC

Decision 4
1: Bag A – 4 balls of 200VC, 6 balls of 160VC
Risk4 2: Bag B – 4 balls of 385VC, 6 balls of 10VC

Decision 5
1: Bag A – 5 balls of 200VC, 5 balls of 160VC
Risk5 2: Bag B – 5 balls of 385VC, 5 balls of 10VC

Decision 6
1: Bag A – 6 balls of 200VC, 4 balls of 160VC
Risk6 2: Bag B – 6 balls of 385VC, 4 balls of 10VC

Decision 7
1: Bag A – 7 balls of 200VC, 3 balls of 160VC
Risk7 2: Bag B – 7 balls of 385VC, 3 balls of 10VC

Decision 8
1: Bag A – 8 balls of 200VC, 2 balls of 160VC
Risk8 2: Bag B – 8 balls of 385VC, 2 balls of 10VC

Decision 9
1: Bag A – 9 balls of 200VC, 1 balls of 160VC
Risk9 2: Bag B – 9 balls of 385VC, 1 balls of 10VC

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Decision 10

- Risk10*
- 1: Bag A – 10 balls of 200VC, 0 balls of 160VC
 - 2: Bag B – 10 balls of 385VC, 0 balls of 10VC

4.6 Final questionnaire

If my online data/accounts were hacked, it would be severe

Q1a Strongly disagree 1 2 3 4 5 Strongly agree

My online data/accounts are at risk of being compromised

Q2a Strongly disagree 1 2 3 4 5 Strongly agree

It is likely that my online data/accounts will be breached

Q2b Strongly disagree 1 2 3 4 5 Strongly agree

It is possible that my online data/accounts will be compromised

Q2c Strongly disagree 1 2 3 4 5 Strongly agree

Insurance is an effective method to protect against loss

Q3a Strongly disagree 1 2 3 4 5 Strongly agree

Insurers can be trusted to pay out in the event of a claim

Q3b Strongly disagree 1 2 3 4 5 Strongly agree

I feel comfortable taking measures to secure my own computer(s)

Q4a Strongly disagree 1 2 3 4 5 Strongly agree

I feel comfortable taking security measures to limit the threat to other people and the Internet in general

Q4b Strongly disagree 1 2 3 4 5 Strongly agree

Taking the necessary security measures is entirely under my control

Q4c Strongly disagree 1 2 3 4 5 Strongly agree

I have the resources and the knowledge to take the necessary security measures

Q4d Strongly disagree 1 2 3 4 5 Strongly agree

Taking the necessary security measures is easy

Q4e Strongly disagree 1 2 3 4 5 Strongly agree

Insurance is financially costly for me

Q5a Strongly disagree 1 2 3 4 5 Strongly agree

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- Q5b* Setting up insurance would require too much from me
Strongly disagree 1 2 3 4 5 Strongly agree
- Q5c* Insurance is burdensome for me
Strongly disagree 1 2 3 4 5 Strongly agree
- Q5d* Insurance is time consuming for me
Strongly disagree 1 2 3 4 5 Strongly agree
- Q5e* Insurance is not worth it
Strongly disagree 1 2 3 4 5 Strongly agree
- Q5f* Claiming on insurance could harm a business/organisations reputation
Strongly disagree 1 2 3 4 5 Strongly agree
- Q6a* Insurance is a good idea
Strongly disagree 1 2 3 4 5 Strongly agree
- Q6b* Insurance is important
Strongly disagree 1 2 3 4 5 Strongly agree
- Q6c* I like the idea of taking out insurance to protect me
Strongly disagree 1 2 3 4 5 Strongly agree
- Q7a* People who are important to me think that I should have insurance
Strongly disagree 1 2 3 4 5 Strongly agree
- Q8a* Which of the following have you had in the last 12 months:
Buildings Insurance
0: No
1: Yes
- Q8b* Which of the following have you had in the last 12 months:
Contents Insurance
0: No
1: Yes
- Q8c* Which of the following have you had in the last 12 months:
Flood Insurance
0: No
1: Yes
- Q8d* Which of the following have you had in the last 12 months:
Health Insurance

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0: No

1: Yes

Q8e

Which of the following have you had in the last 12 months:

Cyber Insurance

0: No

1: Yes

Q8f

Which of the following have you had in the last 12 months:

Vehicle Insurance

0: No

1: Yes

Q9

How many insurance claims have you experienced in the past 12 months?

Q10a

Safety first

Totally disagree 1 2 3 4 5 6 7 8 9 Totally agree

Q10b

I do not take risks with my health

Totally disagree 1 2 3 4 5 6 7 8 9 Totally agree

Q10c

I prefer to avoid risks

Totally disagree 1 2 3 4 5 6 7 8 9 Totally agree

Q10d

I take risks regularly

Totally disagree 1 2 3 4 5 6 7 8 9 Totally agree

Q10e

I really dislike knowing what is going to happen

Totally disagree 1 2 3 4 5 6 7 8 9 Totally agree

Q10f

I usually view risks as a challenge

Totally disagree 1 2 3 4 5 6 7 8 9 Totally agree

Q10g

I view myself as a...

Risk avoider 1 2 3 4 5 6 7 8 9 Risk seeker

Q11a

I am likely to purchase cyber insurance

Strongly disagree 1 2 3 4 5 strongly agree

Q12

What would influence your decision to buy cyberinsurance?