Instituto Superior Técnico
2019/2020 - 2nd Semester

Entrepreneurship, Innovation and Technology Transfer
Midterm Report

habitus

An image recognition app that helps correct your bad habits

Group 16

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Executive summary

Our product A software application based on machine learning and image recognition algorithms that help to correct unhealthy desk habits.

The need The bad sitting issues and unhealthy behaviors when behind the computer are common these days and are causing spend millions of euros per year for the correcting effect of those habits. And some of the procedures used for prevention and correction need to handling with physical components or medical prescriptions or even the solutions more user-accessible, are lacking effectiveness. There is a need for a portable and effective way to correct bad habits related to desk habits while not requiring so much app-user interaction.

The solution Our application will help people correct their bad habits. The main objective is to notify the user about the unintentional urge to engage in a bad habit, like bad posture, biting their nails or picking their nose. The applications use the computer's webcam images with the help of artificial intelligence to learn and detect their habits. It will also support the promotion of new healthier habits.

Our target market Our target market are individuals who spend a lot of time sitting at a computer and would like to improve their habits.

Value proposition The application helps with the commitment to changing the bad habits and interacts in a way that motivates the user to keep the main goal. Solving some of these bad habits can result in better productivity and reducing the use of medicines to achieve better health and increasing life quality.

Competitive advantage Our advantages are the high accuracy in Desk-behavior detection and can be used to detect multiple habits related to these problems. The application also provides a deep analysis report about the improvement over time and some strategies based on that data to keep the motivation and commitment to fixing the bad habits.

What is the problem?

Nowadays, we use a large part of our life working, studying or doing other things sitting in front of a monitor and it0s becoming an issue, affecting our health and our lives.

Before technology, we used to have an active job, but now jobs are more associated with sedentary and physical inactivity. The American Heart Association reported that only 20% of the current workforce possess physically active jobs. In 2000, OSHA (Occupational Safety and Health Administration) estimates the direct cost of the musculoskeletal disorders caused by a lack of ergonomics was listed at $20 billion, with total annual costs rising to $54 billion. Another study concluded that over 30% of workers say having an ergonomic preoccupation with the workspace would improve their mood and help them to be more productive.

On average, we likely spend eight hours sitting at the desk and, the bad sitting habit mentioned before, is not the only problem here. Other surveys reveal that some typical desk items could be around seven times more contaminated than the usual toilet seats, which often get more attention for cleaning. Since this, bad desk habits, such as the frequent face-touching behavior, became a relevant matter to keeping us safe from all living organisms at our desks.

After COVID 19, these things have a greater impact on public health, where the world is concerned about the virus and is trying to control this pandemic situation. The University of Arizona made a study where putting an armless virus on a single doorknob or a table, in a typical office building, and they detected the virus on 40% to 60% of workers, visitors, and commonly touched objects in only four hours of the experiment. Not only did this pandemic situation make our lives even more sedentary, but it also made several bad habits to resurface. Also, changing habits is sometimes a hard thing and can take time to become routine. It is here when our solution comes to solve these problems of who spends time behind

a desk and in front of a computer. We found out that type of thing was not only a common problem in our University ecosystem but also was a conversation topic at home and work.

Some market research…

Issues, problems and opportunities

Our first idea of who the product would be directed towards was people who spend a lot of time sitting at a computer who would like to improve their habits but haven't had much luck with other habit trackers that are available on the market.

There are many habit tracking apps on the market (e.g. Habitica), however there are few apps that track the habits without requiring user input. With something like posture correction this isn't viable because the likelihood that the person isn't aware that they are sitting incorrectly is high. That's the reason why those habit trackers, which tend to be more often webapps or phone applications, tend to turn their focus into more conscious habits like hydration. Because of that, we consider those apps to be too different in order to be included in the list of our direct competitors.

Our competitors

There are however a few possible competitors: PostureMinder, Postureminder and Fix Posture. The first two work in very different ways despite having the same name.

PostureMinder

The first PostureMinder is a Chrome extension that asks a few questions about the user's habits and then based on those habits reminds the user to sit correctly every few minutes. The big disadvantage that this product has in comparison to the one we're proposing is lack of statistics - since there's no camera data, there is no way to determine if the app is in fact having a positive effect. The only way something like that could be implemented is if the user kept track of the amount of times that they had bad posture, but this again requires user interaction.

Postureminder

The second Postureminder is an application made for Windows which uses the camera to determine if the user is sitting correctly. One advantage they have is that their sole focus on posture leads to them having more material that is directed towards improving posture, such as ergonomic training material. This can however be seen as a disadvantage, because they only appeal to the segment of the population that is very concerned with posture whereas the product we propose could be seen as more of a habit improvement suite. The other major disadvantage that they have is that their website has an outdated design, little contact information and in some ways looks almost abandoned, meaning that people will hesitate to trust them.

Fix Posture

Lastly there is Fix Posture, which is less a product and more a proof of concept. In terms of the concept, it works much like our proposal, with the caveat that it's a webapp and not a computer application. This would make it less appealing to potential customers, since the idea is to have an application that works with the least direct user input possible.

A more in-depth comparison in which we detail the differences between the three can be found at the competitive benchmarking information table in the Attachments section.

Collection of market data

In order to better understand possible market opportunities, find our target audience and gain valuable insight into the specific needs of potential customers, a market analysis was performed.

Thereby the collected knowledge is presented below. This is not intended to be an all-encompassing examination of the process followed, but rather an overview of some relevant final findings.

Online general public survey

First, we made an online survey and got a feeling of how our product's ideas would be perceived by the wider public and corporations. One of the survey's objectives was to understand what market segment would be more receptive to our idea: companies with open office spaces or private individuals. The survey can be found in this link.

In the Attachments section, under survey highlights, we point out some of the answers we thought were most important to show the viability of our idea.

Personal interviews

Secondly, a few interviews were carried out with the purpose of acquiring more in-depth information. Therefore, extra considerations were taken for non-verbal behaviors and to uncover latent needs. It was also made an effort to make the interviewee more comfortable to offer suggestions.

In the interviews, we guided people to what would be our product, tried to understand the main problems and doubts that could arise and made some initial product related questions, like:

- What type of notification would you like more? Pop-up, ringing, ...?
- Would you like an app that would correct all of the bad habits? Or just some of them?

It was added perceptive open questions that led to new discoveries as well, such as:

- What would you change? How did you feel?
- What do you like and dislike about the product?
- How would you feel about an accuracy of 80% in detecting bad habits?

The answers revealed people do worry about their small habits and are open to trying to solve them with technology. They also want this technology to work well with little intervention, are not willing to spend too much and are eager to implement new features. Some people even thought it would be helpful for them to use while on videoconferences to make sure they leave a good impression by maintaining a good posture.

What do our customers want?

After getting in touch with our prospective clients our next goal is to put their input to work so that we can set our app apart from the rest of the competition.

Costumer needs

Given this, we started by analyzing the answers we got (from the survey and the interviews) and tried to find the inquired's afflictions so we could point out their needs.

The (prospective) clients' needs are very important since they help us define specifications for our product. Some of these may be expected and, more importantly, some may be new: The inquired may point us to unexpected and innovative specs for our product.

From our analysis we gathered a total of 16 needs which are clearly explained in the customer needs table in the Attachments section. Most of the listed needs were interpreted from what the inquired told us directly (the inquired are aware of their need). On the other hand, the last 2 needs (need 15 and 16) are considered to be latent needs (the inquired have this need but may not be aware of it/don't know it). Upon analyzing the table this should be taken into consideration.

Product specifications

Having identified the customers' needs we can now proceed to define the product specifications. Based on the identified needs, the defined product specs were the following:

- The product should make the user improve their bad habits (in needs 1-5, 7 and 9);
- It shouldn't require too much user input (need number 6);
- It could also have a way of minimizing the user's surrounding noise (need number 8);
- It must allow the user to choose which habits to correct (need number 10);
- It shouldn't require a long time for installing and learning how to use (need 11);
- It should have a very high accuracy of image detection (need 12);
- The product should be affordable (need 13);
- It should be able to work correctly at the same time as other applications that use the camera (need 14);
- It should work with as little CPU and RAM as possible (need 15);
- It should work without an Internet connection (need 16).

For each product specification (and corresponding need) there is an associated metric with a corresponding unit which allows us to measure to what extent that specification has been met once the product concept is developed. For a given metric there's an ideal value and a marginal value (acceptable value for that metric since the ideal value is hard to reach). All of the defined metrics, units, degrees of importance, marginal and ideal values for each product spec can be found in the metrics table presented in the Attachments section.

House of quality

Taking into consideration the data presented in all the previously mentioned tables (customer needs, respective product specifications, metrics and comparison with competitor products) these will be gathered in one single place: the house of quality. This will help us plan concept and product development. The house of quality is presented in Figure 1.

How should we do this?

For most projects there are always various implementation alternatives to fulfill the same purpose. Since there's usually more than one way to develop the product, it's always integral to do it. Hence, the idea of "concepts" was introduced.

In this scenario concepts are the different alternatives/ways to implement the project. It's important to detail the implementation alternatives (concept generation) and to determine which alternative fulfills the most client needs (concept selection). The alternative to do this is most certainly the best choice of procedure!
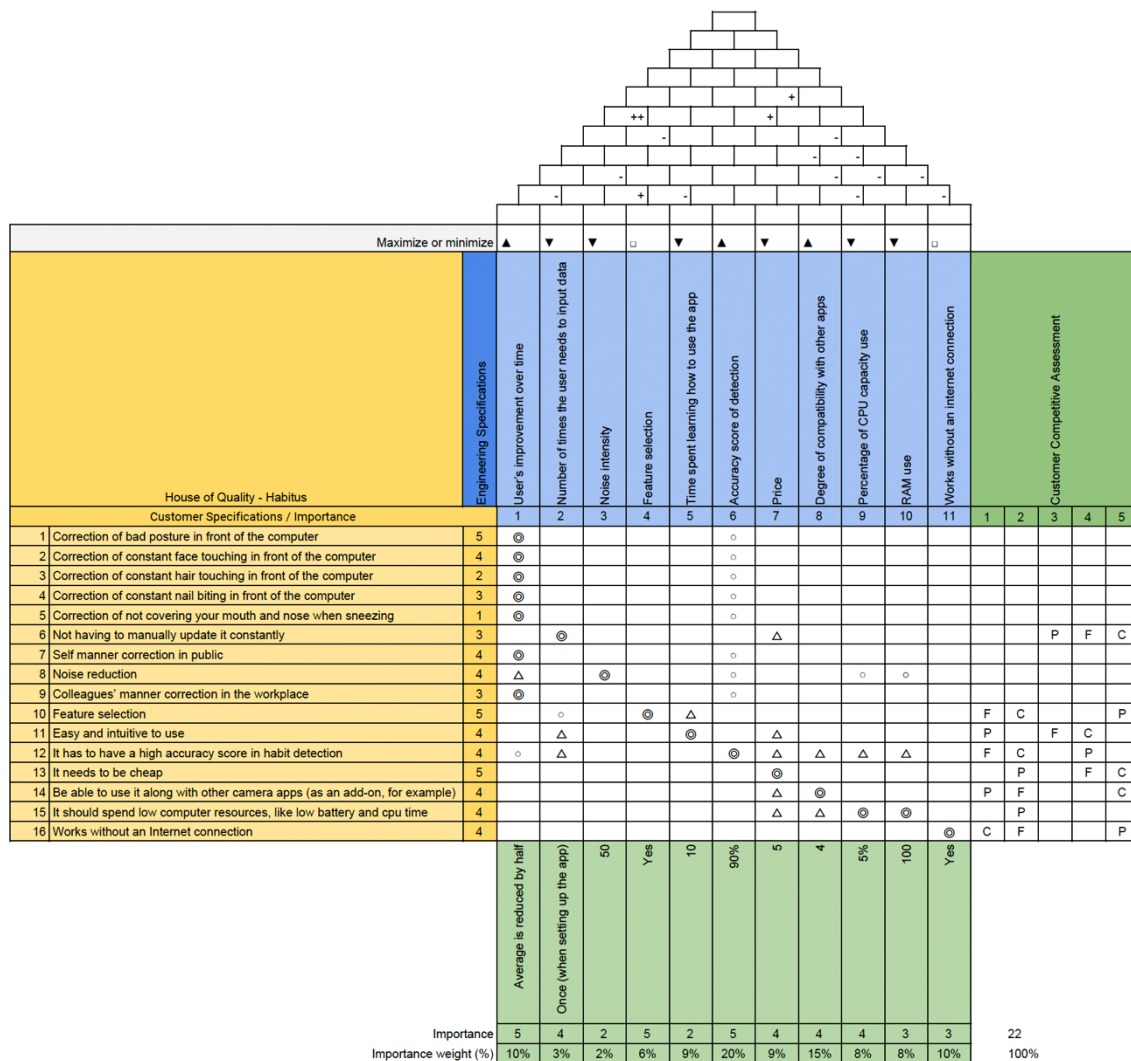
House of Quality – Habitus

Maximize or minimize	▲	▼	▼	□	▼	▲	▼	▲	▼	▼	□					
Engineering Specifications →	User's improvement over time	Number of times the user needs to input data	Noise intensity	Feature selection	Time spent learning how to use the app	Accuracy score of detection	Price	Degree of compatibility with other apps	Percentage of CPU capacity use	RAM use	Works without an internet connection	_	Customer Competitive Assessment			
# — Customer Specifications / Importance	Imp	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
1 Correction of bad posture in front of the computer	5	◎					○										
2 Correction of constant face touching in front of the computer	4	◎					○										
3 Correction of constant hair touching in front of the computer	2	◎					○										
4 Correction of constant nail biting in front of the computer	3	◎					○										
5 Correction of not covering your mouth and nose when sneezing	1	◎					○										
6 Not having to manually update it constantly	3		◎				△								P	F	C	
7 Self manner correction in public	4	◎					○										
8 Noise reduction	4	△		◎			○			○	○						
9 Colleagues' manner correction in the workplace	3	◎					○										
10 Feature selection	5				◎	△							F	C			P
11 Easy and intuitive to use	4	△				◎	△						P		F	C	
12 It has to have a high accuracy score in habit detection	4	○	△				◎	△	△	△	△		F	C		P	
13 It needs to be cheap	5							◎						P		F	C
14 Be able to use it along with other camera apps (as an add-on, for example)	4							△	◎				P	F			C
15 It should spend low computer resources, like low battery and cpu time	4							△	△	◎	◎			P			
16 Works without an Internet connection	4											◎	C	F			P
Target values		Average is reduced by half	Once (when setting up the app)	50	Yes	10	90%	5	4	5%	100	Yes					
Importance		5	4	2	5	2	5	4	4	4	3	3			22		
Importance weight (%)		10%	3%	2%	6%	9%	20%	9%	15%	8%	8%	10%			100%		

Figure 1 House of quality for habitus

Concept generation

In view of the explanation above, the considered concepts are some of the ideas we had of implementing our product. The considered concepts were:

- **Concept 1: Computer program/app**
  - Software that uses the webcam to detect the user's bad habits;
  - Programed in Python using TensorFlow and OpenCV libraries;
  - It has friendly and calm pop-up notifications;
  - It has the option to select which features the user wants activated:
  - It has tutorial videos of small exercises and stretches to do every once in a while (this is more targeted for bad posture habits);
  - It reminds the user to take breaks from the computer;
  - It shows bad habit statistics (such as number of times the user incurred in a bad habit, improvement, etc);
  - It works while other apps are using the webcam (e.g. Skype);
  - It has calming background music so people start feeling calmer and therefore stop their nervous/bad habits;
  - It has a light theme and a dark theme;

- o It gives the user positive feedback (i.e. incentive such as: "You're doing great. Keep it up!";
  - o The user can set goals;
  - o It requires installation.
- **Concept 2: Browser add-on**
  - o It has many of the same functionalities of alternative 1, but it is a browser add-on only available with an internet connection;
  - o It also uses the computer's webcam and image recognition APIs/libraries (e.g. TensorFlow.js, p5.js, ml5.js) to detect the bad habit;
  - o It requires no installation.
- **Concept 3: Computer program/app with chair alert**
  - o It has the same functionalities as alternative 1, but notifies the user in a different way: Though chair vibration;
  - o It has a hardware element connected to the users' chair that gives a small vibration every time the webcam detects a bad habit;
  - o It needs internet connection or Bluetooth for the chair's attached device;
  - o Uses a small microcontroller (e.g. Arduino) to manage the communication and the chair vibration/buzzer.

Since we're at a very initial stage of creating our product these concepts may be subject to small changes.

Concept selection

After defining the concepts, we compared them in order to find out which one was the best alternative for developing our product. The table which we used to do this comparison is the concept selection table which can be found in the Attachments section.

With the aid of the concept selection table, we ended up opting for concept 1 since it had the best total score.

Concept 2 was the most unappealing alternative. Additionally, to the low total score in the selection table we also became aware of other obstacles associated with this alternative. Firstly, with the product being a web browser add-on this could shackle us in terms of feature number and variety. Another disadvantage is that our software would be dependent of another company's software, in this case the web browser. Finally, for our product to be available to as many clients as possible the group would have to develop an add-on version for every (or as many as possible) web browser(s). This is an additional workload that can be avoided.

Concept 3 was also a very tempting option since the chair buzzer seemed like a very unique feature for our product to have and also fun for the team to implement. Nevertheless, we quickly realized that having this feature meant additional costs in hardware (to buy the microcontrollers) and in product distribution (to deliver the microcontrollers to our clients): That would mean an increase in product cost which we think would be very unappealing for our clients.

Even though we already have a clear idea about which concept we'll implement, we are still at a very initial phase of actually creating the product. Hence, we may change our implemented concept a bit. For example, if concept testing shows that clients would like to have the alternative of buying the chair buzzer as an extra, the final concept may be the combination of concepts 1 and 3.
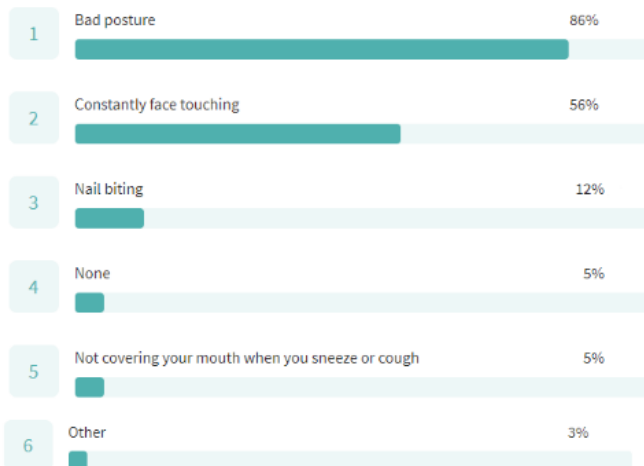
Concept testing

At this time, we haven't started any concept testing since we are at a very early development phase. Nevertheless, this will be the next phase of our product development.

Attachments

Survey highlights

At the computer, what bad habits do you have that you would like to improve?

1	Bad posture	86%
2	Constantly face touching	56%
3	Nail biting	12%
4	None	5%
5	Not covering your mouth when you sneeze or cough	5%
6	Other	3%

The survey clearly showed that one of people's biggest concerts when sitting at their desks are bad posture and face touching.

We assume that the second concern is probably due to the present COVID-19 situation. This leads us to believe that an app like this can be used as a way to prevent the spread of diseases, especially in big offices.
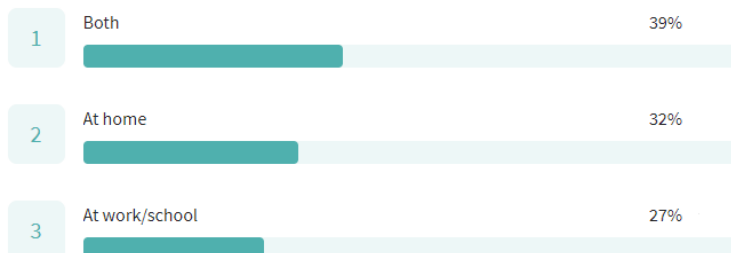
Do you still use it? If not, why?

1	Yes!	50%
2	I kept forgetting to input data	33%
3	It didn't help me	16%
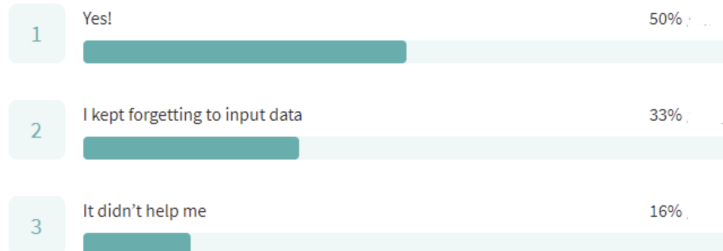
This question asks if people still use habit trackers in general and the reason for discarding them.

Keeping to forget to input data could easily be solved by our app.

Where do you think a habit tracker would be more useful?

1	Both	39%
2	At home	32%
3	At work/school	27%

By the responses, we reached the conclusion that the app could be designed for both corporate and individual clients. However, as an initial approach we decided to focus on creating an app for individuals and then possibly expand the product to incorporate the business sector.

Customer needs table

Need nr.	Question/Prompt	Customer statement	Interpreted need	Importance (1-5)
1	At the computer, what bad habits do you have that you would like to improve?	Bad posture Constantly face touching. Hair touching. Nail biting. Not covering mouth and nose when sneezing.	Correction of bad posture in front of the computer	5
2			Correction of constant face touching in front of the computer	4
3			Correction of constant hair touching in front of the computer	2
4			Correction of constant nail biting in front of the computer	3
5			Correction of not covering your mouth and nose when sneezing	1
6	Do you still use a habit tracker? If not why?	I keep forgetting to input data and/or get tired of it	Not having to manually update it constantly	3
7	Do you pay extra attention to your behavior in an open office?	Yes	Self-manner correction in the workplace	4
8	What are the main disadvantages of working in an open office?	Noise, colleagues' bad habits/manners	Noise reduction	4
9	Do you find the bad habits of your colleagues in your open office unpleasant?	Yes	Colleagues' manner correction in the workplace	3
10	Would you like an app that would correct all of the bad habits? Or just some of them?	I would like to choose the features I want to improve and not have all showing up at the same time	Feature selection	5
11	Is it easy for you to learn how to use new technologies?	More or so. I don't want anything too complicated that would	Easy and intuitive to use	4

		take too much of my time to learn		
12	Using an image recognition based technology, how would you feel about an accuracy of 80%?	I don't want to be wrongly notified	It has to have a high accuracy score in habit detection	4
13	Would you pay for an app that uses your computer camera to correct your habits?	Maybe, but I wouldn't want to spend too much money on it	It needs to be cheap	5
14	Do you use apps that use your camera (like video conference calls)?	Yes, and I would want to be able to use apps like Zoom or Skype and get notifications for my bad habits at the same time	Be able to use it along with other camera apps (as a Skype/Zoom add-on, for example)	4
15			It should spend low computer resources, like low battery and CPU time	3
16			Works without an internet connection	4

Metrics Table

Need nr.	Metric	Importance (1-5)	Units	Marginal value	Ideal value
1, 2, 3, 4, 5, 7, 9	User's improvement over time (regarding a single habit) with the previous week as reference	5	Weekly average number of times that the user does a bad habit	Average is reduced by half	Average is reduced to 0
6	Number of times the user needs to input their personal data	4	-	Once (when setting up the app)	0
8	Noise intensity [1]	2	dB	50	20
10	Feature selection	5	Yes/No	Yes	Yes

[1] Based on a table with noise intensity values for various circumstances
https://courses.lumenlearning.com/physics/chapter/17-3-sound-intensity-and-sound-level/

11	Time spent installing and learning how to use the app	2	min	10	2
12	Accuracy score of detection	5	%	90%	100%
13	Price	4	€	5	0
14	Degree of compatibility with other apps	4	1 - 5	4 (Compatible with quickly fixed bugs)	5 (Completely compatible)
15	Percentage of CPU capacity use	4	%	5%	<2%
15	RAM use	3	MB	100	<100
16	Works without an internet connection	3	Yes/No	No	Yes

Competitive benchmarking information table

Need nr.	Metric	Importance (1-5)	Units	PostureMinder Chrome Extension	Postureminder	fix-posture.glitch.me
1, 2, 3, 4, 5, 7, 9	User's improvement over time (regarding a single habit) with the previous week as reference	5	Weekly average number of times that the user does a bad habit	N/A	N/A	N/A
6	Number of times the user needs to input their personal data	4	-	0	1	0
10	Yes/No	5	Yes/No	No	Yes	No
11	Time spent installing and learning how to use the	2	min	1 min	10 min	1 min

	app					
12	Accuracy score of detection	5	%	N/A	N/A	N/A
13	Price	4	€	free	$19.99	free
14	Degree of compatibility with other apps	4	1 - 5	1	0 (none)	0 (none)
15	Percentage of CPU capacity use	4	%	N/A	4%	N/A
15	RAM use	3	MB	N/A	≈23	N/A
16	Works without an internet connection	3	Yes/No	No	Yes	No

Concept selection table

Selection criteria	Weight (%)	Concepts					
		1		2		3	
		Rating	Weighted score	Rating	Weighted score	Rating	Weighted score
Correction of bad posture in front of the computer	10	5	0.5	5	0.5	5	0.5
Correction of constant face touching in front of the computer	7	4	0.28	4	0.28	4	0.28
Correction of constant hair touching in front of the computer	7	4	0.28	4	0.28	4	0.28
Correction of constant nail biting in front of the computer	6	4	0.24	4	0.24	4	0.24
Correction of not covering your mouth and nose when sneezing	5	4	0.2	4	0.2	4	0.2
Not having to manually update it constantly	8	5	0.4	5	0.4	5	0.4
Self-manner correction in the workplace	5	4	0.2	4	0.2	4	0.2
Noise reduction	1	1	0.01	1	0.01	1	0.01
Colleagues' manner correction in the workplace	1	1	0.01	1	0.01	1	0.01
Feature selection	8	5	0.4	4	0.32	5	0.4
Easy and intuitive to use	7	4	0.28	5	0.35	3	0.21

It has to have a high accuracy score in habit detection	7	5	0.35	5	0.35	5	0.35
It needs to be cheap	9	4	0.36	4	0.36	2	0.18
Be able to use it along with other camera apps (as a Skype/Zoom add-on, for example)	5	3	0.15	0	0	3	0.15
It should spend low computer resources, like low battery and CPU time	6	4	0.24	3	0.18	4	0.24
Works without an internet connection	8	5	0.4	0	0	1	0.08
Total score		4.30		3.68		3.82	
Rank		1		3		2	
Continue?		Develop		No		No	