Diploma Programme
Programme du diplôme
Programa del Diploma

Information technology in a global society
Case study: The FaceToFace facial recognition application

For use in May and November 2020

Instructions to candidates

- Case study booklet required for higher level paper 3 information technology in a global society examinations.

Foreword

The ITGS case study, *The FaceToFace facial recognition application*, is the stimulus material for the research investigation required for May and November 2020 higher level paper 3. All of the work related to the case study should reflect the integrated approach explained on pages 15–17 of the ITGS guide.

Candidates should consider *The FaceToFace facial recognition application* with respect to:
- relevant IT systems in a social context
- both local and global areas of impact
- social and ethical impacts on individuals and societies
- current challenges and solutions
- future developments.

Candidates are expected to research real-life situations similar to *The FaceToFace facial recognition application* and relate their findings to first-hand experiences wherever possible. Information may be collected through a range of activities: secondary and primary research, field trips, guest speakers, personal interviews and email correspondence.

Responses to examination questions **must** reflect the synthesis of knowledge and experiences that the candidates have gained from their investigations. In some instances, additional information may be provided in examination questions to allow candidates to generate new ideas.

Overview

There is a growing trend to use technology that authenticates individuals based on their bodily or behavioural characteristics, such as fingerprints, voice, iris or gait. A survey by Market Wired predicted that the global biometric technologies market will reach $41.5 billion by 2020, significantly greater than the $14.9 billion in 2015.

FaceToFace, a small start-up business, was founded in South-East Asia in 2017 by Mike Lim, a computer science graduate, and two of his friends from university: Carol Tan, a marketing graduate, and Sandra Li, a law graduate. Mike developed the initial facial recognition algorithms while at university but had no idea how to market them. Carol saw great potential for facial recognition software in a variety of areas, but she was not sure about the associated legal and ethical implications. While waiting for coffee one afternoon in their university coffee shop, the three decided that the coffee shop would be the ideal location as a starting point for their venture.

Current situation

In an effort to improve customer loyalty, the university coffee shop currently has a loyalty card programme that stores customers' personal details and coffee preferences. The loyalty card data is stored in the coffee shop's customer database stored in the cloud.

Members are issued with a loyalty card that they can present when they make a purchase, so they can collect points that are redeemable for free coffee and seasonal promotions. Customers can choose whether to opt in to this loyalty card programme.

The *FaceToFace* facial recognition application was introduced into the university coffee shop as a proof of concept in an attempt to solve the problems related to long queues at busy times of the day and the lack of personal service caused by a high turnover of coffee shop staff. The coffee shop was chosen to prove the concept rather than a school or office.

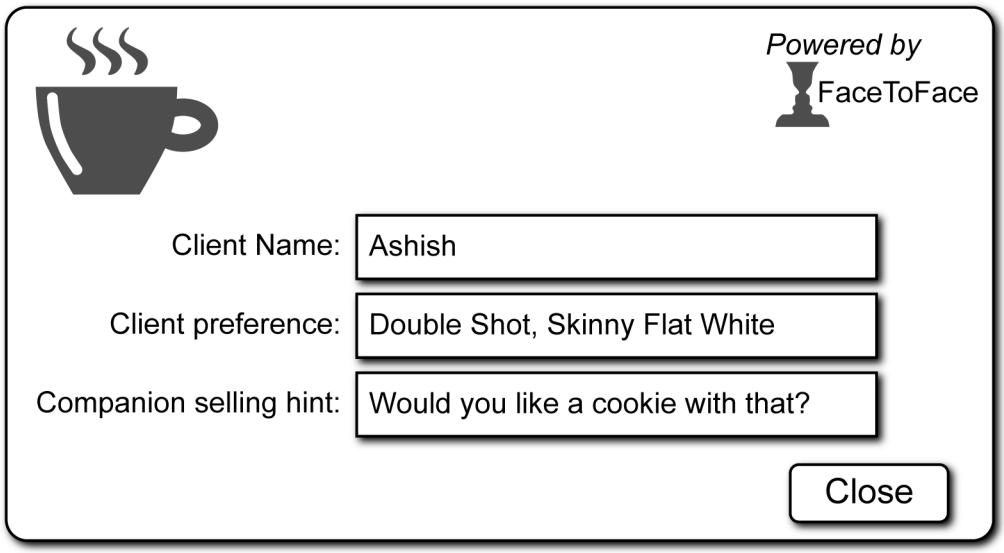
With the facial recognition application installed, the first time a customer approaches the till to make a purchase, they will be asked whether they wish to have their facial image linked to their loyalty card data.

The customer must be a member of the loyalty card programme if they wish their facial image to be linked to the customer database.

If the customer does not want their facial image to be used or linked to the loyalty card programme, they can choose to opt out.

On subsequent visits, when customers who have linked their facial image to the loyalty card programme approach the cashier to make an order, the facial recognition application will capture an image of their face and match it to a record in the database. This will provide the cashier with details about the customer. The *FaceToFace* facial recognition application will identify the customer to the coffee shop staff who can then greet them by their name and offer them their preferred choice of coffee.

Figure 1: An example of the prompt displayed to the cashier for a customer whose record exists in the coffee shop database



If a customer has opted out of the loyalty card programme, the coffee shop staff will not be provided with personalized information about the customer or their coffee preferences.

Currently, the *FaceToFace* facial recognition application is software as a service (SaaS) and uses cloud-based processing and storage for the facial recognition data. This data is then linked to the customer database in the coffee shop's point-of-sale (POS) system to provide prompts to the staff using the facial recognition application. *FaceToFace* is leasing processing and storage facilities from a reputable cloud service provider for the facial recognition application.

The proof of concept was a huge success, with the coffee shop having shorter queueing times and an increase in the satisfaction of both coffee shop staff and customers.

Next steps

South-East Asia Coffee Shops (*SEACS*), a local chain of coffee shops, observed the successful partnership between *FaceToFace* and the university coffee shop. They have approached Carol for a meeting about the use of the facial recognition application in their shops.

Mike has informed Carol and Sandra that this development will require an upgrade to the existing IT cloud-based infrastructure. This infrastructure will need to be scalable to accommodate not only *SEACS*'s project but also future clients.

Sandra has advised that, since the data is being shared between the coffee shops, which are located in a number of countries in South East Asia, there will also be legal and ethical implications to be considered. She is also keen that any policies developed would enable a roll-out of the facial recognition application to a wider market.

Challenges faced

Carol believes that the market for facial recognition systems has great potential and she is keen for *FaceToFace* to consider expanding into new markets, such as schools and offices.

Mike, Carol and Sandra are aware that the expansion of the facial recognition application into these new markets will present a number of challenges. They held a meeting and drew up a list of possible challenges that may result from such an expansion.

Technical challenges

- Different clients may have different thresholds for accuracy (error rate) in the identification of the user. These different levels of accuracy will require the adaptation of the algorithms and may require different numbers of nodal points to be matched.
- The *FacetoFace* application must allow for interoperability and be forward compatible with future clients' databases.

Legal challenges

- The storage and use of data is governed by national laws. For example, the General Data Protection Regulation (GDPR) in the European Union (EU) is far more stringent than other national privacy laws. Sandra is conscious that these laws will need to be discussed with *FaceToFace*'s clients and that policies will need to be developed to ensure compliance and proper procedures are implemented.
- Sandra is concerned about accountability if a data breach occurs.

Ethical challenges

While Mike was developing the new facial recognition application and integrating it into *SEACS*, the team realized there were a number of ethical issues that needed to be addressed.

- Sandra wants to ensure any future expansion is underpinned by sound ethical principles. She suggests that an impact analysis should be cooperatively undertaken by *FaceToFace* and clients using a range of decision-making tools, such as a privacy impact assessment (PIA) and ethics canvases.
- There should be a code of ethics to which *SEACS* and any other potential stakeholders should subscribe when any collaboration takes place. This may need to be adapted for various clients.
- Privacy, anonymity, surveillance and the need for consent are significant concerns that may arise with new developments such as the facial recognition application.
- Cloud storage of facial images and continual gathering of information, such as date and time of purchases made by *SEACS* customers, are a concern for Sandra.
- Accessibility of data by third parties. Once *FaceToFace* has created applications that can be linked to databases, others – such as governments and other companies – may wish to access this information. This could directly contradict the expressed desire of *FaceToFace* for complete transparency in how their data is managed.

Social challenges

Any introduction of a new ICT system can have impacts on the behaviour of individuals, organizations and societies.

- Sandra is concerned that the introduction of facial recognition systems could lead to changes in the way people behave when they are aware they are being watched.
- If people accept facial recognition as a part of their everyday lives, it could become easier for less ethical future applications to be accepted without thorough investigation.
- Some people may feel that the introduction of facial recognition applications could lead to an increasing level of surveillance.

Marketing challenges

105 Carol is interested in expanding into other markets. These are:

- airports
- offices
- schools
- shops.

110 Expansion into these markets may provide a number of opportunities as well as challenges.

Key terms associated with *The FaceToFace facial recognition application*

ACM Code of Ethics
ACTIVE ethics
Algorithm
Autonomy
(Biometric) nodal points
Consent
Data ethics canvas
Data migration
Data sharing formats
Ethics canvas
Forward compatibility
General Data Protection Regulation (GDPR)
Image analysis
Interoperability
Loyalty card programme
Metrics
Opt in / opt out
Point-of-sale (POS)
Privacy impact assessment (PIA)
Proof of concept
Software as a service (SaaS)
Start-up business
Usability

Any individuals named in this case study are fictitious and any similarities with actual entities are purely coincidental.

References:

CS Market Wired, 2016. *Global Biometric Market to Reach USD 25.31 Billion By 2020 — Estimation & Forecast Report 2015-2020* [online] Available at: <http://www.marketwired.com/press-release/global-biometric-market-reach-usd-2531-billion-by- 2020-estimation-forecast-report-2015-2103248.htm> [Accessed 18 January 2019].