

# **LLM-Driven Visa Application Processing in Embassy-Absent Regions aided by VFS Global**

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## **1. Introduction**

Migrating between countries can bring positive changes to one's life, especially for the younger generation seeking better opportunities abroad. Study visas are particularly popular among them, viewed as challenging yet rewarding. Third-party facilitators like VFS Global assist in visa processing, operating in 151 countries with 3388 application centers worldwide, notably serving countries like Australia, the UK, Ireland, and Canada.

VFS Global streamlines the visa application process, handling online form completion, fee payment, and document submission, enhancing accessibility and efficiency. However, challenges persist in traditional embassy visa decisions, particularly in verifying scanned documents, leading to a laborious and error-prone process. This study aims to investigate and automate time-consuming processes within both VFS operations and embassy visa decisions, with a focus on improving efficiency without overstating the author's personal experiences with the student visa process.

## **2. As Is**

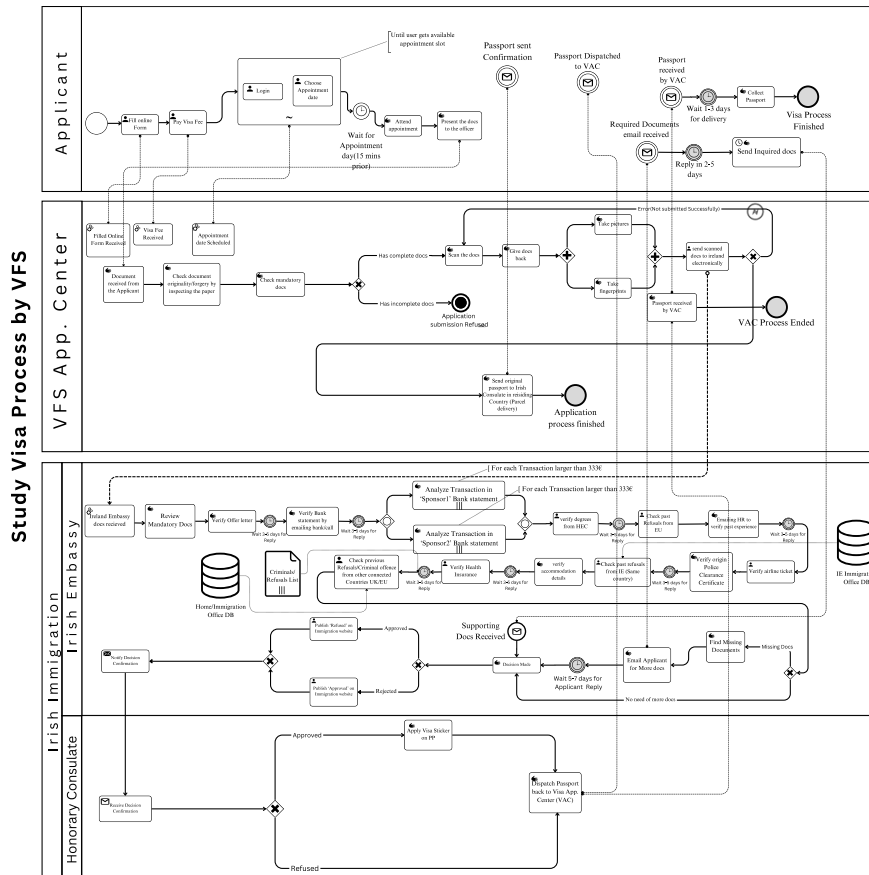


Figure 1: Current BPMN of Student Visa Process (Zoomable)

## 2.1 Analysis

The current manual processes in the visa application center result in a slow turnaround time of 50-60 days, as Visa Officers (VOs) handle multiple tasks, often verifying documents and corresponding for authenticity. Traditional machine learning models lack the breadth of data required for effective processing. Advanced intelligent models are essential for comprehensive document comprehension. Each VO manages 19 tasks, with the primary responsibility of visa decision-making, requiring meticulous attention to detail due to the significant impact of even minor discrepancies. This scrutiny prolongs the process, underscoring the need for more efficient procedures.

## Applicant

The initial applicant process involves four manual steps: attending the appointment punctually, presenting documents to an attendant at the VFS office for scanning, sending any requested documents, and finally returning to the VFS office to collect the passport. Failure to compile documents or arrive on time may result in the need to reschedule and repay fees.

## **A. VFS Application Centre/Visa Application Centre (VAC)**

This pool has 11 manual tasks from which 3 tasks can not be automated or improved; one of them is to taking fingerprints, pictures and the other is to send the passport to Consulate by post. Importantly, rearranging the 150-200 unstapled documents and then scanning them is the task which makes the whole appointment very lethargic process and requires at least 45 minutes just for these two tasks.

## **B. Irish Immigration Department**

### **Embassy (1<sup>st</sup> Swim Lane):**

In this swim lane, one Visa Officer (VO) handles 19 tasks, including the pivotal responsibility of making visa decisions. The VO verifies every detail of submitted documents, recognizing that even minor discrepancies could impact the decision. The visa application process involves thorough steps to ensure document authenticity and completeness. Initial document reviews identify inconsistencies, followed by verification of offer letters, bank statements (with particular attention to transactions over €333), sponsor bank statements, work experience, and accommodation details. Direct communication is utilized to confirm information and request any missing documents, ensuring the integrity and accuracy of the visa application process.

### **Honorary Consulate Pool (2<sup>nd</sup> Swim Lane):**

They are responsible for only two tasks and both of them are manual tasks. Applying the visa sticker received from the Irish Embassy onto the passport and dispatching the passport back to the VFS office or Visa Application Centre (VAC) through physical delivery.

## **2.2 Cost Impact**

The older system incurred significant time-related costs, averaging 50-60 days per visa application due to manual tasks. Visa officers, handling 19 tasks each, contributed to lengthy processing times. At VFS centers, document scanning took 45 minutes per appointment. Each officer could only review one application at a time, leading to processing times of 2.5-3 months per application. These inefficiencies required a large workforce, estimating a need for 21,000 officers. Overall, manual processes hindered timely and efficient visa processing.

### **For Irish Immigration:**

If let's say alone VFS system has been automated from our proposal then VFS starts sending 10,560 applications daily, so in order to keep up Irish Immigration Department needs:

*Number of Visa Officers required to process 1 application per month = 2 Visa Officers \* Number of Applications sent from VFS*

*VO Required = 2 \* 10560 = 21,120*

*Assuming average per hour rate of VO = 100€*

*Hours spent per VO on every application = 80 days \* 8 hours daily = 640 hours*

*Salary paid to every VO = 640 \* 100 = 64,000€ per month (Ideally)*

*Visa fee paid to Embassy = 60€*

*Loss on every application = 64,000 - 60 = 63,940€*

***Loss every month to Immigration Department due to legacy and manual system = 10,560 \* 64,940€***

***Loss =- €67 million***

So, they are facing loss of €67million every month.

**For VFS Global:**

***Assuming average per hour rate of VFS Staff in Pakistan = 2€***

***Customers catered per day with current system = 8 hours of in daily shift / 80 minutes = 6 customers***

***Salary paid each staff per day = 2€***

***VFS Fee = 65€***

***Profit/Loss every day = 6 customers catered every day\*(VFS fee charged) – Salary paid to every staff member***

***=6\*(65) - 16***

***Profit = 374€***

VFS Global is still in profit because they charge a huge fee in euros and pay staff according to the national average salaries, whereas Immigration is taking a hefty loss of €67 million.

## **2.3 Error Rates**

Error rate in visa application process is nothing more than the appeals that are filed by the Applicant, because one small mistake or misjudgments of Visa Officer can lead to again a loss for the second time. There is no extra fee charged for appeals. Assuming error rate is 15%. Lets first calculate the loss after appeal.

***Per hour paid to VO = 100€***

***Hours they have to spend= 80 days\*8 hour shift daily =640 hours***

***Salary paid to VO to process every application = 100\*640 = 64000€***

***Fee Charged from Applicant = 60€***  
***= 60 – 64000 =63,940***

If Immigration receives an appeal on this application,

Their loss will be doubled or atleast by 1.5 times, because VO have to go through again and do whole process for the same fee.

***Loss if they receive Appeal on every application = 1.5 ( 63,940)***

***Loss after Appeal every applicant = 97,410***

***As applications were = 10,560***

***Appeals received on 15%= 1584***

***As appeals takes less time than first time applications,( half of original time)***

***Hours need to spend on appeals on average = 40 days \*8 hours daily =320***

***Salary paid to every VO = 320\*100€ = 32,000€ per month (Ideally)***

***Visa fee paid to Embassy = 60€***

***Loss on every application = 32,000€***



Although immigration departments are government-owned and larger in scale, automation is crucial due to lengthy decision times—60-80 days per application—and the need for efficiency. The process may be repetitive, but each case has unique aspects, necessitating tailored investigation. Automation is particularly vital given the high volume of outbound travelers, as reported by Express Tribune, with 765,000 people leaving Pakistan in 2022 alone.

### Improvements in Visa Application Centre

The enhanced visa application process combines task automation and resequencing. Previously, out of 6 steps for applicants, 2 were manual, but now, with the addition of a new feature, the process is streamlined. Applicants upload all required documents, including work experience, cutting VFS processing time by 100%. After document upload, applicants only need to attend the appointment to submit their passport, making the process smoother. VFS now has only 4 manual tasks, reducing interaction time with candidates from 40-45 minutes to 10 minutes. Previously, document scanning took up to 30 minutes, but with improvements, the process now takes only 10 minutes, reducing the overall appointment time from 100 to 10 minutes.

### Improvements for Irish Embassy:

The main advantage of the process automation which is RPA in our case as we are not changing the whole system of the visa process, we are just automating and improving the existing system just by automating tasks of investigation, authentication, verification and forgery of all the documents.

First the proposed system will email to verify and cross check the provided documents from the concerned regulatory bodies and organization. This is automated with the help of two means live calling or emailing. Live calling will be done where regulatory body is in the visa intended country i.e. University, Accommodation. For other bodies, the system must email them in a specific format for cross checking. Example of email for HR is provided below:

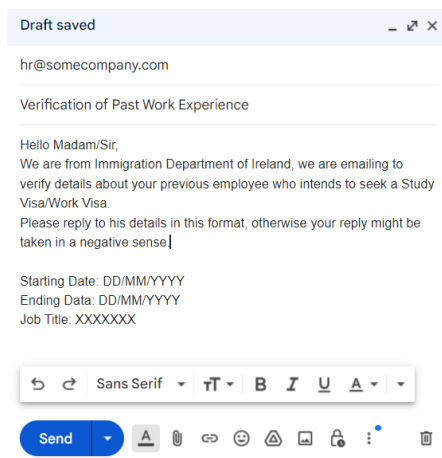


Fig: Email Sample for HR

After emailing and calling all 6 different entities, system uses the Large Language Model to assess the missing document and email the applicant. It followed by sentiment analysis using VADER and LLMs to ensure correspondence with provided documents. Bank statements are converted to text via OCR and assessed by the LLM, focusing on transactions exceeding €333 and matching them with provided proof. The second phase automates six API calls simultaneously, generating a summary with 'True' indicating consistency and 'False' for inconsistencies. This report aids Visa Officers in decision-making, offering a highly automated, less error-prone, and time-saving process, with the option for manual document review if necessary.

### **Improvements for Honorary Consulate:**

Unfortunately, no improvements can be done in their tasks, Applying Sticker and dispatch the passport back to the VFS Office which cannot be further improved or automated. However, it is up to the VFS if they want to deliver the passport straight back to the applicant home with some extra charges, which is done but optionally and can be made mandatory.

## **2.1 Cost Improvements**

### **For Irish Immigration:**

Time required to process one application reaches from 640 hours to 40 hours, impressively improved by 93.75%.

If let's say alone VFS system has been automated from our proposal then VFS starts sending 10,560 applications daily, so in order to keep up Irish Immigration Department needs:

***Number of Visa Officers required to process 1 application per month = 2 Visa***

***Officers \* Number of Applications sent from VFS***

***VO Required = 2 \* 10560 = 21,120***

***Assuming average per hour rate of VO = 100€***

***Hours spent per VO on every application = 1 day \* 8 hours daily = 8 hours***

***Salary paid to every VO = 8 \* 100 = 800€ per application (Ideally)***

***Visa fee paid to Embassy = 60€***

***Loss on every application = 800 - 60 = 740€***

***Loss every month to Immigration Department due to proposed system = 10,560 \* 740€***

***Loss = - €7m***

So, you can compare the difference in loss before and after, €67m of loss every month and we have improved it by 95% as instead of 480 hours, we only need to spend 8 hours.

Note: Per hour rate has taken as a baseline, hence its still in loss. Otherwise by number of hours spent on each application is improved by 95%

### **For VFS Global:**

***Assuming average per hour rate of VFS Staff in Pakistan = 2€***

***Customers catered per day with current system = 8 hours of in daily shift \* 60 / 10 minutes  
= 48 customers***

*Salary paid each staff per day = 2€*

*VFS Fee = 65€*

*Profit/Loss every day = 48 customers catered every day\*(VFS fee charged) – Salary paid to every staff member*

*=48\*(65) - 16€*

*Profit every day = 3104€*

From implementing our proposed system, VFS can cater 48 customers instead of just 6, improving it by 700%.

VFS Global is still in profit because they charge a huge fee in euros and pay staff according to the national average salaries.

## **2.3 Error Rate Reduction**

Implementing automation in the visa application process presents a significant opportunity to boost efficiency and reduce errors. The system's role is solely to expedite processing, leaving the decision-making to experienced visa officers, ensuring both speed and accuracy. Automation streamlines manual tasks such as document verification and data processing, particularly in scrutinizing bank statements, minimizing human error and meeting SLAs. This efficiency allows visa officers to focus on higher-value tasks, enhancing decision quality and decreasing processing errors. Despite automation, the final decision remains in the hands of the visa officer, reducing the likelihood of appeals and enhancing customer satisfaction. Furthermore, our automated system enables tracking of visa appeals post-decision, facilitating proactive issue identification and continuous process improvement, ensuring a more efficient and error-free visa application process.

## **2.4 Productivity Gains**

With this system, problem of not getting appointments can be solved, catering time of 70-100 minutes in VFS office can be reduced to just 10 minutes and improved by 90%. Every VFS office has just 1 staff member for Ireland and more than one for UK, it takes around 80 minutes on average, so only 6 people can be catered per day. However, with our system, the contact time goes down to 10 minutes, it reaches 480 applicant per day can be catered with just one staff member.

In one month, more than 10,500 can be catered by just one staff member. so now there won't be any bottlenecks and problem of not getting appointments which is the main rising problem if you want a Schengen visa in 2024 from Dublin.

For the tasks of VO, one VO can review only 1 application at a time, so they processed one application in more every 2.5-3 months, appeals take more than 13 months, so in order to cater 10,500 every month, they need 21,000 visa officers, which is impossible for any company to hire that many people just to do these tasks, hence our system is perfect for them.

From our system now, 1 VO can process ~5 applications every month. So, processing time has increased by 15 times. and by 97% percentage and for VFS, time has been improved by 700%



## 4 Proposed Methodology

The proposed RPA methodology will take approximately 1 month to automate processes. We'll utilize LLM to identify inconsistencies in documents and emails, minimizing the need for improvement time. Data security is ensured as OpenAI will delete data after 7 days. We'll incur no costs for changes or updates, utilizing LLM APIs and paying per call for third-party solutions, thus shifting the responsibility for improvement and maintenance to them.

The initial enhancement in the process involves enabling users to independently upload documents.

Upon receiving the application, the Irish Embassy employs an automated AI system to handle various tasks concurrently, bypassing the typical 5-7 day waiting period between each task. These tasks include communication with the bank manager and HR etc. via email etc. This simultaneous execution eliminates delays associated with the manual handling of 7 distinct tasks, totaling 35 days. Then, sentiment analysis of the natural language outcomes of emails and calls is performed using VADER and LLMs to ensure correspondence with provided documents. Bank statements are converted to text via OCR and assessed by the LLM, focusing on transactions exceeding €333 and matching them with provided proof. The second phase automates six API calls simultaneously, generating a summary with 'True' indicating consistency and 'False' for inconsistencies. This report aids Visa Officers in decision-making, offering a highly automated, less error-prone, and time-saving process, with the option for manual document review if necessary. Given the varied formats of responses, sentiment analysis is best conducted by a Language Model (LLM) to minimize errors, as rule-based systems or in-house trained Machine Learning models may not address all scenarios

This summary in form of the tables where you have Document and have True or False if found inconsistency or forgery is presented by True or False. Secondly, another form of summary is prepared by LLM in Natural Language and both of them will be reviewed and review the specific document if needed; by the Visa Officer at the end making their work error and stress free and more systematic.

The system will process data using OpenAI's API calls and an in-house trained ML model, facilitating easy scalability. Neither VFS staff nor VO will face prolonged processing times, as applicant processes will be streamlined just like E-Visa. The project's ROI is impressive due to the cost-effectiveness of LLM calls. For one application, there are 6 free automated email calls, 1-2 live phone calls, and 2 LLM calls. Additionally, out of 5 API calls, only 1 incurs a commercial cost, while the rest are either internal or sourced from government databases. With LLM calls costing \$0.002 per 4000 tokens, and each application typically requiring 3 input calls, the expenses are minimal even with large documents like a 100-200 pager bank statement.

**Hence, one application costs you, the cost is only  $2 \times 0.002$  per application.**

**$= (\text{Number of calls} \times \text{LLM Cost} + \text{Number of calls} \times \text{API Cost}) \times \text{Number of Sponsors}$**

***Number of sponsors are usually 1, so one statement is of Applicant and 1 is of Sponsor, hence***

**$= (2 \times 0.002 + 0) \times 2$**

***Recurring Cost of processing one application for Visa Officer = 0.008 USD***

***Recurring Cost of automating VFS Process = 0\$***

As we only did resequencing and allowed the user to upload their own documents while filling form, this has one time cost of around 10k\$ maximum.

Implementation Cost of automating the VO tasks could be in the range of 50-100K\$

## **5 Conclusion**

In conclusion, the proposed system significantly enhances the visa application process through automation and streamlined manual tasks, leveraging state-of-the-art LLM Models. Automation of document verification, authentication, and data processing reduces error risks, ensuring SLA compliance and enhancing decision quality. While the final decision rests with the visa officer, automation allows them to prioritize high-value tasks, resulting in fewer processing errors and increased customer satisfaction.

Moreover, automation implementation yields substantial cost savings and productivity gains. By minimizing manual intervention and streamlining processes, application processing time reduces drastically from an average of 80 days to just 7 days, marking a 91% improvement. This leads to faster turnaround times and heightened satisfaction. The project boasts a compelling return on investment (ROI), with minimal recurring costs and the potential for scaling to handle high application volumes, potentially increasing profits by 200%.

Automation decreases error rates by leveraging machine-driven processes, mitigating the risk of human error and ensuring decision-making consistency. Continuous monitoring and data analysis facilitate proactive issue identification and ongoing process enhancement, culminating in a more efficient and error-free visa application process.

In conclusion, the proposed system provides a comprehensive solution to address delays, errors, and inefficiencies in the visa application process. Through automation, significant improvements can be achieved, including cost savings, increased efficiency, and reduced error rates, marking a pivotal step towards modernizing and optimizing visa processing procedures.