NHS Improvement

Guide to the RPA process evaluation tool

February 2019

We support providers to give patients safe, high quality, compassionate care within local health systems that are financially sustainable.

Contents

Introduction

We know from our own experiences of running robotic process automation (RPA) programmes as well as those shared with us by trusts that assessing the complexity and cost of a potential automation can be challenging. To help you prioritise your RPA automations and estimate their net financial impact, we have developed the **RPA process evaluation tool**.

The process evaluation tool is an Excel-based model structured around inputs that capture the processes for potential automation. From these inputs, the tool determines how easy it would be to automate them (the complexity) and estimates the possible cost of this based on the number of days automation would take (developer days). The cost of automating each process is then weighed against the likely benefits (as input by the user) to give a net financial impact (the net benefit). Finally, on a matrix, the tool displays the net financial impact and the ease of automating each process, allowing the user to prioritise or disqualify any potential automations.

Please note: The tool provides a guide only. The user will need to apply discretion regarding the potential benefits and hold any external suppliers to account for the costs of the automation.

Using the tool

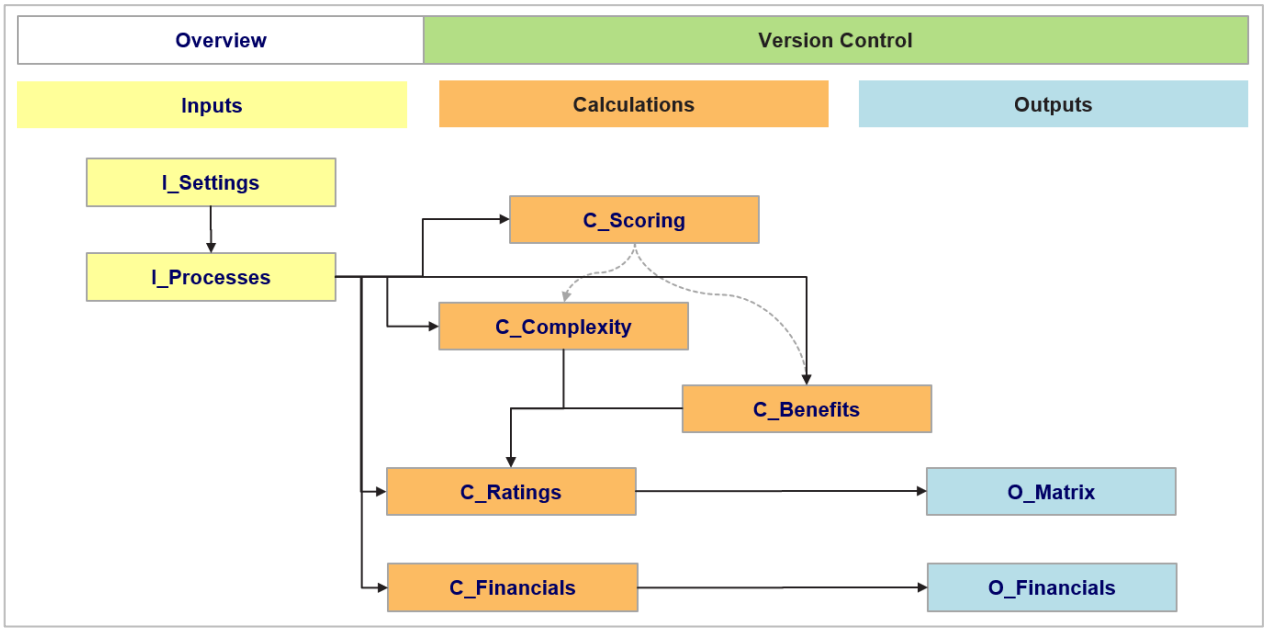
Structure

The tool is structured around input, calculation and output worksheets:

- **Input worksheets:** These are for the input of the data from which the calculation worksheets generate the outputs.
- **Calculation worksheets:** The tool's 'intelligence' resides in these worksheets. An understanding of how these worksheets complete their calculations is not required to produce any of the outputs.
- **Output worksheets:** These display the ease of automation versus the financial benefit for each process as well as the full net present value (NPV) over five years.

The arrows in Figure 1 show the data flows between these worksheets.

Figure 1: Tool structure (also shown on the tool's Contents worksheet)



Tip: The tool can be navigated quickly by clicking on the worksheet names in Contents.

Input worksheets

These are where the user needs to enter basic information before the tool can calculate any outputs.

The names of these worksheets have the prefix 'I_'.

Settings

The **I_Settings** worksheet (Figure 2) contains the information the tool needs to calculate the outputs. These fields are pre-populated but we recommend that the user reviews and updates the values as necessary.

Figure 2: The I_Settings input worksheet

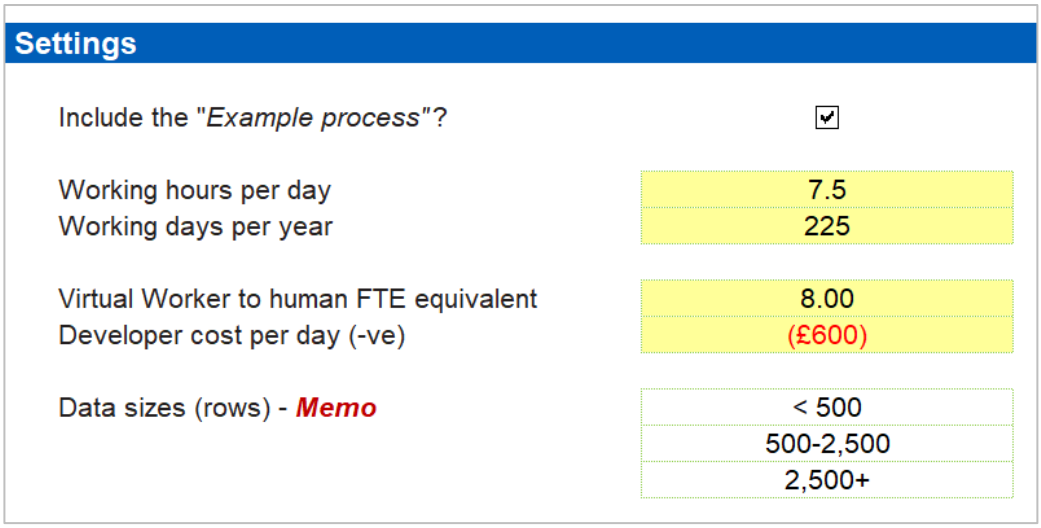


Table 1 describes each of the fields.

Table 1: Inputs to the I_Settings worksheet

Input	Description
Include the "Example process"?	By default, the tool gives an example process to guide the user when entering their own processes. It may be necessary to hide this example process in any outputs.
Working hours per day	The average number of hours per day human workers are contracted to work. This value is used when determining the potential benefits from automation.

Input	Description
Working days per year	The average number of days per year human workers are contractually obliged to work. This value is used when determining the potential benefits from automation.
Virtual worker to human FTE ratio	As outlined on NHS Improvement's RPA site,[1] RPA uses virtual workers in place of humans to carry out work. This value represents how many virtual workers equate to one human worker.
Developer cost per day	The average cost of an RPA developer (or RPA development team) per day. This is used to drive the costing element of the tool.
Data sizes (rows)	The quantity of data involved in a process can drive complexity. This is a memorandum field which the tool uses to compute complexity.

Processes

The **I_Processes** worksheet (Figure 3) asks questions about the processes a user may want to automate. The answers inform the outputs from the tool that enable the user to see the potential benefits from and complexity of the automation.

Figure 3: Part of the I_Processes input worksheet

Process definition

Process name	Example process	
Description	An example process	

Process outline

			Example process	Untitled
Input	% of process that can be automated		85%	
	Time taken to complete single process (hours)		0.1	
	Times process is completed per year		80,000x	
	FTEs involved in process	i	8.00	
	Cost per FTE (per year) (-ve)		(£30,000)	
	Non pay costs (per year) (-ve)		(£15,000)	
Output	Productivity saved per year (hours)		5,667	0
	Productivity saved per year (cost)		£100,741	£0
	Virtual Worker licences required		1.00	0.00
	FTE utilisation		49.4%	0.0%
	FTEs to retain after automation		1.00	0.00
	FTE costs saved (per year)		£210,000	£0

[1] https://improvement.nhs.uk/resources/robotic-process-automation/

Tip: More processes can be added to the tool using the **Add Process** button. Processes can also be removed using the **Delete Process** button.

Four sections of this worksheet require user input:

- process definition
- process outline
- process complexity
- process benefits and costs.

Process definition

In this section the user should enter the name and a brief description of the processes being entered into the tool. This ensures adequate context should the tool be shared with other users.

Process outline

In this section the user is asked questions about the existing state of the process (see Table 2). This enables the metrics to be calculated for use in the **Process benefits and costs** section.

To complete this section the user will need a good working knowledge of the process as well as its dependents.

Table 2: Inputs to the process outline section of the I_Processes worksheet

Input	Description
% of process that can be automated	An estimate of how much of the end-to-end process could realistically be automated.
Time taken to complete single process	The time in hours it takes to complete a process – that is, the start to finish time.
Times process is completed per year	The number of times a process is completed in a single year.
FTEs involved in process	The number of FTE workers who undertake the task. If a user spends 20 hours a week on a process and they are contracted to work 40 hours a week, 0.5 should be entered as a value

Input	Description
Cost per FTE (per year)	The blended cost for an FTE worker undertaking the process. If multiple FTE workers complete the process and have different costs, a weighted average should be entered. The value must be entered as a negative.
Non pay costs (per year)	The non pay costs associated with completing the process in a single year.

When the inputs are complete, the tool will produce outputs that can be referenced in the **Process benefits and costs** section. These are outlined in Table 3.

Table 3: Outputs in the process outline section in the I_Processes worksheet

Output	Description
Productivity saved per year (hours)	The productivity saved per year in hours is determined from the percentage of the process which can be automated, the number of times the process is executed per year and the time it takes to complete the process.
Productivity saved per year (cost)	The productivity saved in hours is converted into a financial saving using the cost per FTE value (Table 2).
Virtual worker licences required	The number of licences required to automate the process is calculated from the virtual worker-to-FTE ratio (from **I_Settings**).
FTE utilisation	The time it takes the number of FTE workers to complete the process in a year and the working hours in a year (from **I_Settings**) are used to compute how well utilised an FTE worker is in undertaking the process.
FTEs to retain after automation	After automation, the tool computes the minimum number of FTE workers who should be retained to handle exceptions and the parts of the process which cannot be automated.
FTE costs saved (per year)	The potential FTE savings are computed from the retained FTE workers and the cost per FTE.

Process complexity

This section is used to determine how easy it is to automate a process. The more complex a process, the greater the development and ongoing costs are likely to be.

To complete this section the user will need a good working knowledge of the process and the applications involved.

> **Tip:** The processes most suitable for automation are completely digital.

The inputs are described in Table 4.

Table 4: Inputs to the process complexity section of the I_Processes worksheet

Input	Description
Number of applications involved: simple application	In completing the process, how many simple applications are used? A simple application is one which is minimalist in design and does not have many windows or fields. Examples include Microsoft Office products and websites.
Number of applications involved: complex application	In completing the process, how many complex applications are used? A complex application is one which may have a complicated user interface and many windows open within windows. Examples include ESR and EPRs (eg Cerner, eHospital).
Number of applications involved: Citrix application	In completing the process, how many applications are accessed through virtualisation, such as Citrix or virtual machines?
Number of screens involved: simple application	For the simple applications entered above, the corresponding number of screens that users have to navigate to complete the process.
Number of screens involved: complex application	For the complex applications entered above, the corresponding number of screens that users have to navigate to complete the process.

Input	Description
Number of screens involved: Citrix application	For the Citrix applications entered above, the corresponding number of screens that users have to navigate to complete the process.
Data processing: simple	The number of simple datasets processed as part of the process. A simple dataset is one which requires simple data modifications such as removing specific characters, concatenation and filtering for values.
Data processing: complex	The number of complex datasets processed as part of the process. A complex dataset is one which requires more advanced data modifications such as the extraction of complex patterns from text or data manipulation with multiple outcomes.
Business logic: simple	The number of simple business rules followed as part of the process. A simple business rule is one for which there are **few** conditions and outcomes. An example could be that, in an employee download from HR, the start date column must not be blank.
Business logic: complex	The number of complex business rules followed as part of the process. A complex business rule is one for which there are **many** conditions and outcomes. An example could be that, in an employee download from HR, if the home phone number field is blank, the mobile phone number field must be completed, or if both are blank, a personal email address and work phone number must be present.
Data size	The number of rows or records which make up the dataset for the process.

Process benefits and costs

This section is used to state the potential benefits and costs associated with automating the processes. In determining the benefits, the outputs from the **process outline** section can serve as a useful guide. In more complex organisations, additional benefits from streamlining a large value chain may not

have been captured in the **process outline** section. The outputs from this section are integral to calculating the overall viability of any potential automation.

Calculation worksheets

The calculation worksheets are where the tool's 'intelligence' resides. The tool uses a combination of weightings and scoring thresholds to determine how many days of development it would take to automate a process. This is then converted into a complexity score to inform the ease of automation element of the output matrix.

These worksheets also look at three core financial metrics to determine the benefits element of the output matrix.

The names of these worksheets have the prefix 'C_'.

> **Note:** The tool is explicit in its assumption that the primary aim of automation is reducing costs in the NHS. While an automation may achieve significant time savings, the financial benefit of freeing up staff time must be quantified to achieve a strong benefits score in the O_Matrix worksheet.

Scoring

The **C_Scoring** worksheet contains the logic applied to the user inputs in **I_Processes** to generate the final outputs. It is divided into three sections:

- weights
- scores
- ratings.

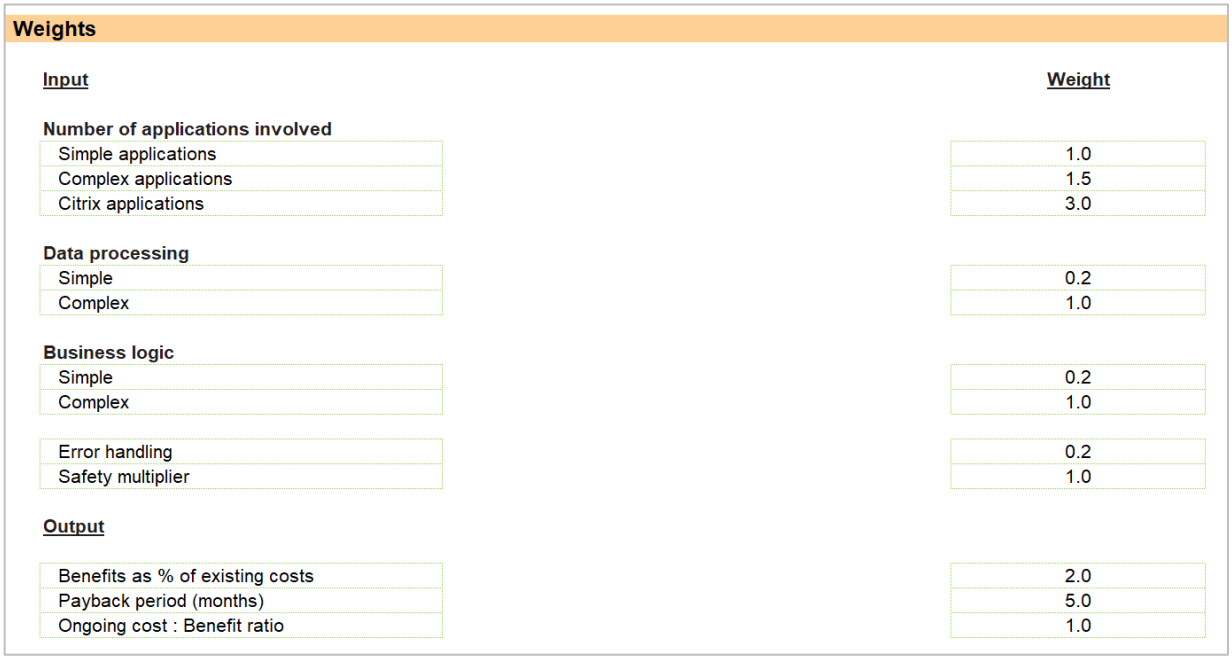
Weights

In assessing how complex a process is to automate, the inputs from the **process complexity** section of **I_Processes** are multiplied by a given weight, to produce a score. As can be seen in

Figure 4, inputs which correlate to complexity are given a higher weighting.

As an example, if a process consists of two simple applications and two complex ones, then the overall score would be **(2 × 1.0) + (2 × 1.5) = 5.0**. This indicates that the total development effort in automating the applications could be up to five days.

Figure 4: The weights section of the C_Scoring worksheet



Weights	
Input	**Weight**
Number of applications involved	
Simple applications	1.0
Complex applications	1.5
Citrix applications	3.0
Data processing	
Simple	0.2
Complex	1.0
Business logic	
Simple	0.2
Complex	1.0
Error handling	0.2
Safety multiplier	1.0
Output	
Benefits as % of existing costs	2.0
Payback period (months)	5.0
Ongoing cost : Benefit ratio	1.0

Two factors not included in **I_Processes** can also be seen in Figure 4: Error handling and Safety multiplier. These factors are determined to account for the complexity associated with building error handling into any automation and to ensure that the final process has been thoroughly tested before launch.

> **Tip:** If using an external provider, ask if they have previously automated the applications involved in your process. If they have, this could reduce the development time and cost incurred in automating your process.

In assessing the benefits associated with an automation, three financial metrics, which are outputs from the **process benefits and costs** section in **I_Processes**, are considered:

- benefits from the automation as a percentage of existing process costs – the higher the percentage, the higher the rating

- payback period in automating the process – the shorter the period, the higher the rating
- ratio of ongoing cost to the benefits delivered – the higher the ratio, the higher the rating.

As can be seen in Figure 4, greatest emphasis is given to an automation paying back as quickly as possible.

Scores

The most time-consuming element of developing an automation is the number of screens involved (and their complexity) and the amount of data (and potential exceptions) which needs to be accounted for. To reflect this challenge in the tool, thresholds for these inputs, alongside a score, have been included in **C_Scoring**, as seen in Figure 5**:**.

Figure 5: The scores section of the C_Scoring worksheet

Scores

Input	Lower Threshold	Upper Threshold	Score
Simple screens involved	1	5	0.5
Simple screens involved	6	10	1.0
Simple screens involved	11	10,000	3.0
Complex screens involved	1	5	1.0
Complex screens involved	6	10	2.5
Complex screens involved	11	10,000	5.0
Citrix screens involved	1	5	1.5
Citrix screens involved	6	10	5.0
Citrix screens involved	11	10,000	10.0
Data size		< 500	0.3
Data size		500-2,500	0.5
Data size		2,500+	0.7

As an example, if a process has six simple screens and one complex screen, then the assigned score would be **(6 × 1.0) + (1 × 1.0) = 7.0**. This indicates that the total development effort in automating the screens could be seven days.

Note: The development effort calculation assumes that the user acceptance and resilience testing phases of RPA development have been completed.

Ratings

To produce the output matrix, ratings from one to five are assigned to the development effort calculation and the three financial metrics.

As can be seen in Figure 6, a rating is assigned that corresponds to the threshold band in which the calculations for the four metrics fall. The calculation to determine which threshold band they fall in is carried out in the **C_Complexity** and the **C_Benefits** worksheets.

Figure 6: The ratings section of the C_Scoring worksheet

Ratings

	Lower Threshold	Upper Threshold	Rating
Development effort (days)		7	5.0
Development effort (days)	7	21	4.0
Development effort (days)	21	42	3.0
Development effort (days)	42	56	2.0
Development effort (days)	56	1,000,000	1.0
Benefits as % of existing costs		10%	1.0
Benefits as % of existing costs	10%	30%	2.0
Benefits as % of existing costs	30%	50%	3.0
Benefits as % of existing costs	50%	75%	4.0
Benefits as % of existing costs	75%	1,000,000%	5.0
Payback period (months)	0	12	5.0
Payback period (months)	12	18	4.0
Payback period (months)	18	24	3.0
Payback period (months)	24	36	2.0
Payback period (months)	36	1,000,000	1.0
Ongoing cost : Benefit ratio		1	1.0
Ongoing cost : Benefit ratio	1	4	2.0
Ongoing cost : Benefit ratio	4	8	3.0
Ongoing cost : Benefit ratio	8	12	4.0
Ongoing cost : Benefit ratio	12	1,000,000	5.0

Note: The lower the development effort, the easier the process is to automate and hence the higher the rating.

Output worksheets

Once the user has entered data into the input sheets, the tool will use the calculation sheets to inform the outputs.

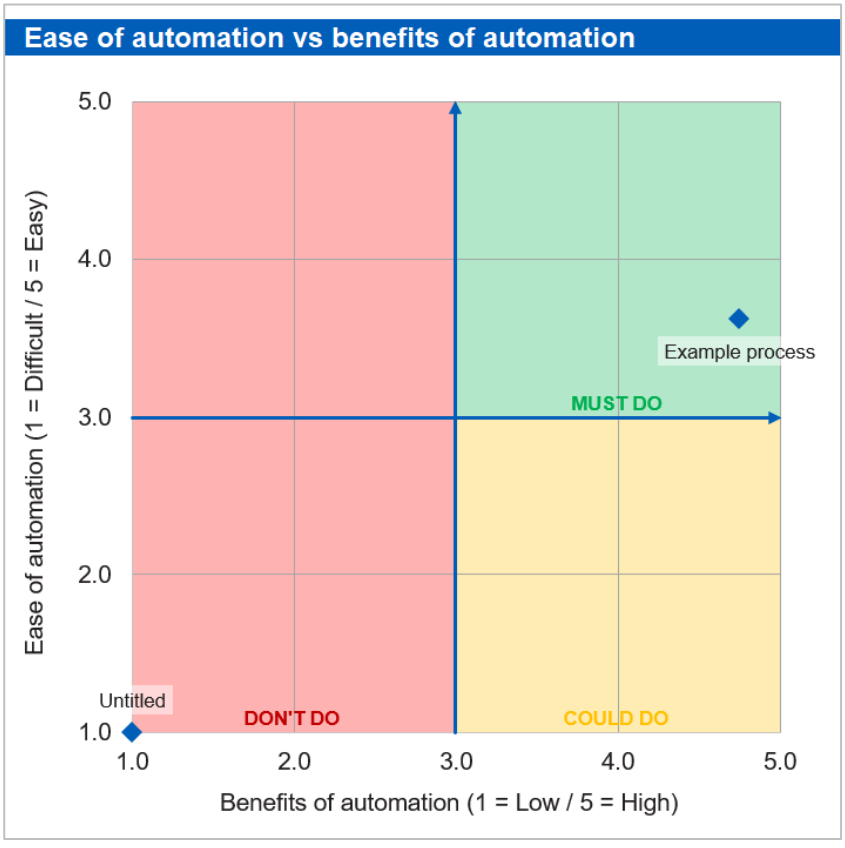
The names of these worksheets have the prefix ‘O_’ and there are two: O_Matrix and O_Financials.

O_Matrix

The **O_Matrix** worksheet displays a PICK chart (Figure 7) comparing the ease of automating the input processes with their associated benefits. The matrix is separated into three sections:

- must do – for any process with an ease of automation score between 3 and 5 and a benefits score between 3 and 5
- could do – for any processes with an ease of automation score between 1 and 3 and a benefits score between 3 and 5.
- don’t do – for any processes with an ease of automation score between 1 and 3 and a benefits score between 1 and 3.

Figure 7: PICK chart in the O_Matrix worksheet



Financials

The **O_Financials** worksheet determines a five-year outlook for the net benefits associated with the automation (Figure 8). It allows the user to look at the benefits from all the processes entered into the tool as well as giving a single, more focused view. This shows the user the NPV and return on investment in a given year.

Figure 8: Financial benefits table in O_Financials

Financial benefits from automation

Cost of capital 3.5%

All processes

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Project costs	(£26,800)					
Benefits		£210,000	£210,000	£210,000	£210,000	£210,000
Ongoing costs		(£12,500)	(£12,500)	(£12,500)	(£12,500)	(£12,500)
Net impact - Profit/(Loss)	**(£26,800)**	**£197,500**	**£197,500**	**£197,500**	**£197,500**	**£197,500**
NPV		**£190,821**	**£375,190**	**£553,323**	**£725,433**	**£891,723**
ROI %		**712%**	**1,400%**	**2,065%**	**2,707%**	**3,327%**

Single process

Process Example process 1

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Project costs	(£26,800)					
Benefits		£210,000	£210,000	£210,000	£210,000	£210,000
Ongoing costs		(£12,500)	(£12,500)	(£12,500)	(£12,500)	(£12,500)
Net impact - Profit/(Loss)	**(£26,800)**	**£197,500**	**£197,500**	**£197,500**	**£197,500**	**£197,500**
NPV		**£164,928**	**£349,296**	**£527,430**	**£699,539**	**£865,829**
ROI %		**615%**	**1,303%**	**1,968%**	**2,610%**	**3,231%**

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