

USER GUIDE



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DOCUMENT CONTROL AND AUTHORITY

Approved By FPL Board of Directors Authorised Signatory/Company Officer:

3

Circulation Date: 05 February 2016 Version Number: v1.05 To install the Forensic Image Analyser (FIA) application, double click on the FIA installer package (FIASetup.msi). Follow the steps in the installation wizard. When the application has been successfully installed, search for Forensic Image Analyser (FIA) application and double click on the logo. When the FIA application is launched, the main screen will be as shown in Figure U1. The FIA application comes with a 30-day trial starting from the day the application is installed. All the processes in FIA are encapsulated in FIA SPN projects to ease the management of camera and photo evidence of end users.

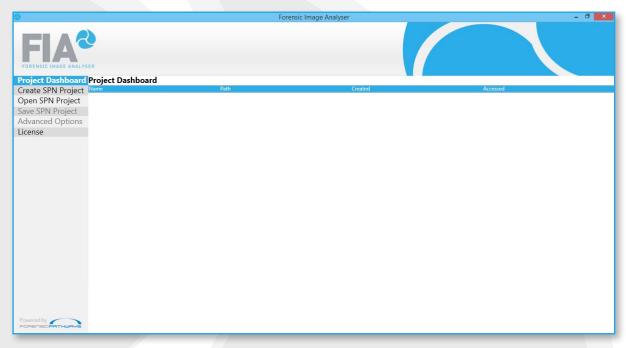


Figure U1: Main opening screen for FIA.

The user can view all the SPN projects in FIA by clicking on 'Project Dashboard'. The Project Dashboard, shown in Figure U2, shows all the recent FIA projects that have been created and saved previously. The Project Dashboard shows the Name of the projects, the path location where they are saved, date created and date last accessed in FIA. The projects are ordered by the most recent date accessed as default, the user can change the default ordering by clicking on the header of the respective column (e.g. click on Name column to order by project name). The first time that FIA is launched, the project dashboard is empty like the one shown in Figure U1.

On the left hand side, the menu allows the user to create a new SPN project, open existing SPN projects or save a current working SPN project. The menu also contains the 'Advanced Options' link which will open a dialog box, where the user can change default properties for FIA. The last link in the menu is the 'Licence' link, from which the user can activate/deactivate the software licence for FIA. The first step to using FIA is to create a new SPN project.

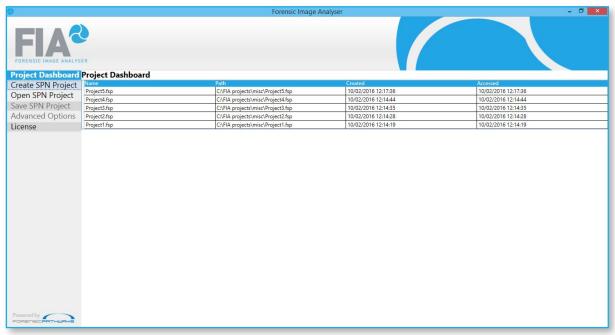


Figure U2: Main screen showing the 'Project Dashboard' with the SPN projects in FIA.

CREATE SPN PROJECT

The Identifier and Classifier functionalities of FIA are contained within SPN projects, which manage the list of photos, device fingerprint and values of FIA properties. When the 'Create SPN Project' button is clicked, a dialog box is opened as shown in Figure U3. A default name for the project, 'NewProject', is suggested. The user can rename the project file as they wish and can then select a location on disk where to save the project. All FIA SPN projects are saved in the fsp format.

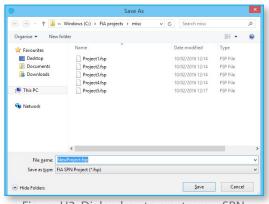


Figure U3: Dialog box to create new SPN project. User can rename project and choose location to save the project.

Once the user clicks the 'Save' button in the dialog box, the Evidence page is opened as displayed in Figure U6. An FIA SPN project keeps a reference of all the photos, device test photos and evidential photos, which are loaded to the project.

OPEN SPN PROJECT

The user can click on the 'Open SPN Project' button to load a previously saved project. A dialog window, shown in Figure U4, allows the user to navigate to the location of the relevant project. Once a project is opened in FIA, the evidence page is shown on screen.

The SPN project can alternatively be opened by opening the project dashboard and selecting the required project in the list.

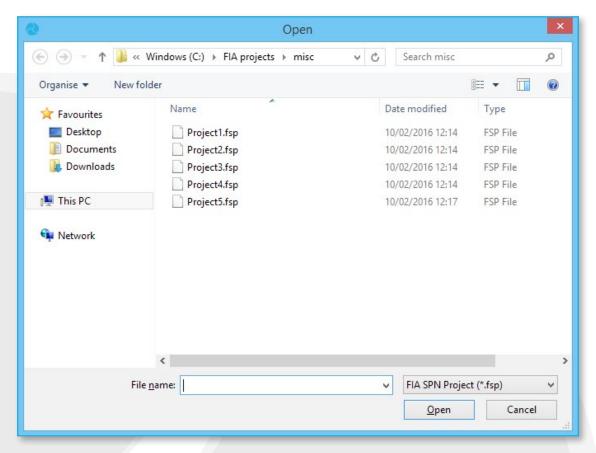


Figure U4: Dialog box to navigate to a previously saved SPN project and open the project.

SAVE SPN PROJECT

When the user creates a new project in FIA, it is automatically saved. The user can press the 'Save SPN Project' button at any stage of the process flow to update any changes made to the project status. All the properties of FIA will be saved with the project.

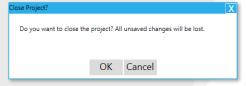


Figure U5: Quit dialog box to inform user that there are unsaved information, when user closes the application.

If the application is closed and there are any unsaved changes to the project, the dialog box in Figure U4 is shown to inform the user that there are unsaved changes in the project.

EVIDENCE PAGE

The evidence page, shown in Figure U6, is displayed whenever a new project is created or a project is loaded. Any operation performed within a project is displayed on the evidence page, which is the main page where the user can launch the Identifier and Classifier.

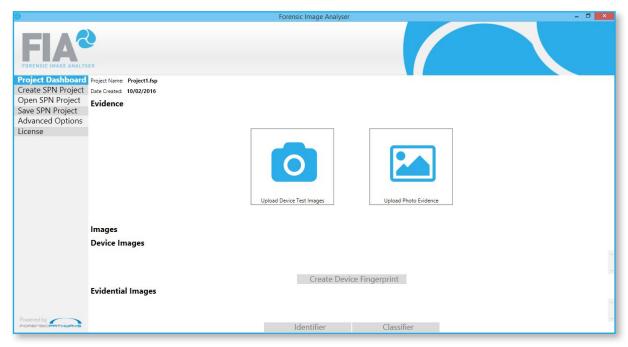


Figure U6: Evidence page in FIA is displayed once the user creates a new project.

The evidence page displays the project name and project creation date. There are two buttons, 'Upload Device Test Images' and 'Upload Photo Evidence', which allow the user to add:

- test photos to create the device fingerprint
- photos that are used to match against the device fingerprint or in the classifier

When either of the 'Upload Device Test Images' or 'Upload Photo Evidence' buttons are pressed, an open image dialog window is displayed as shown in Figure U7, from where the user can choose the photos of interest. FIA supports the JPEG and TIFF image formats.

Once the user selects the photos and clicks open, the images are listed under the Images section on the Evidence page. The test photos to be used for creating the device reference fingerprint are listed under 'Device Images' and the suspect photos to be used in the Identifier or Classifier are listed under 'Evidential Images'. An example of the images after being uploaded in FIA are shown in Figure U8.

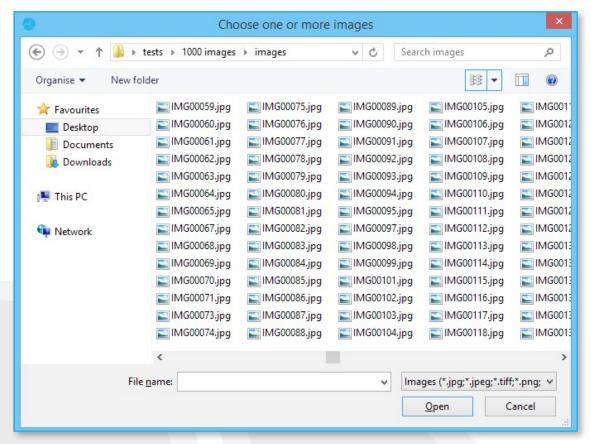


Figure U7: Open image dialog window, where the user can choose a selection of images to load into FIA.

Once the photos are loaded into the project, the user can create the device fingerprint followed by running the Identifier. The classifier can be started directly after loading the evidential photos.

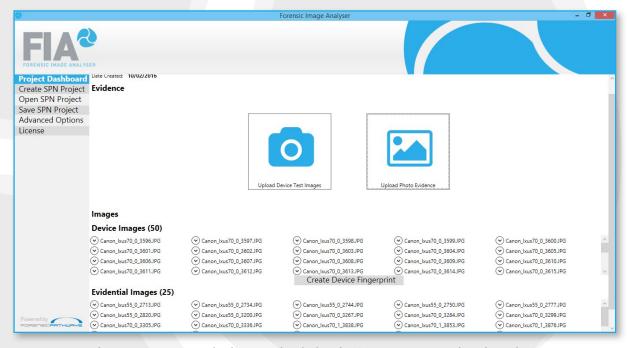


Figure U8: Evidence page in FIA with photos uploaded in the Device Images and Evidential Images sections.

CREATE DEVICE FINGERPRINT

The device reference fingerprint can be created by clicking on the 'Create Device Fingerprint' button shown in Figure U8. Once the user uploads the test photos for the device by clicking on 'Upload Device Test Images', the device fingerprint can be generated. The number of photos needed to create the device fingerprint is explained in more details in section Device Reference Fingerprint in the technical documentation, and the examples of test photos are listed in Appendix A.

When the user clicks the 'Create Device Fingerprint' button, FIA generates the device fingerprint using the device test photos. The FIA main window is greyed out and a busy

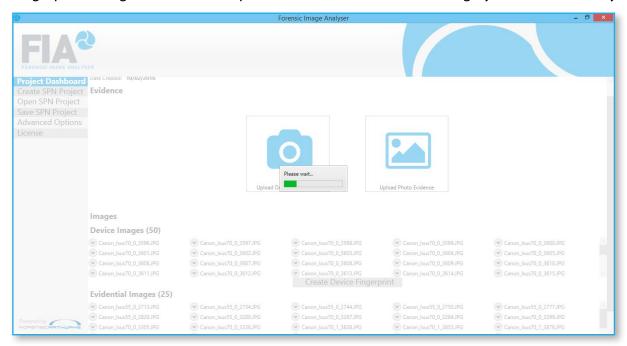


Figure U9: FIA generating the device fingerprint using the device test images. The FIA main window is greyed out and a busy indicator is displayed until the device fingerprint is created.

indicator is displayed until the device fingerprint is created, shown in Figure U9. After the successful creation of the device fingerprint, the message "Device Fingerprint is Up To Date" is displayed under the 'Create Device Fingerprint' button (shown in Figure U9).

Note that the device fingerprint uses the crop size and crop position listed in 'Advanced Options' (can be opened from main menu on the left of main window). If the user makes any changes to the crop size or information, the current device fingerprint will be obsolete. Therefore, a new device fingerprint will need to be generated. The 'Create Device Fingerprint' button will be enabled if any options are altered. If the identifier is executed with a device fingerprint with an outdated crop size or crop position, FIA will flag an error.

IDENTIFIER

The Forensic Image Identifier of FIA can be launched by clicking the 'Identifier' button at the bottom of the evidence page (Figure U6). The Identifier can only be launched if a device fingerprint has been created and evidential images have been uploaded. The Identifier will flag an error if the current device fingerprint in the project does not have the same crop size as currently selected in the project.

All the evidential images need to be of the same resolution (i.e. same size). If there are images of different resolutions, choose a crop size from the 'Advanced Options' menu where the crop size is not larger than the smallest image in the dataset. The larger the crop size, the quality of the signature will be better but the operating time will increase (see section Operational Computation in FIA Technical Documentation for more details).

The FIA window is greyed out with the busy indicator displayed as shown in Figure U10, while FIA is performing the matching process during the identification phase.

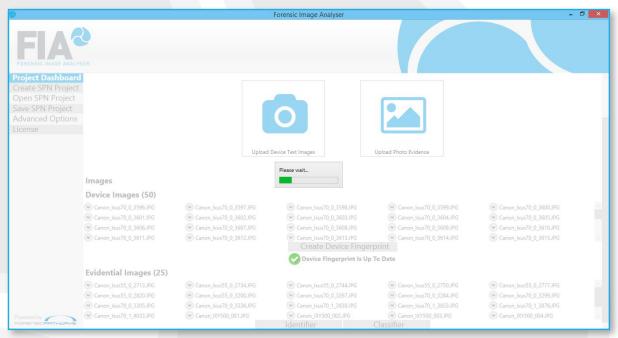


Figure U10: FIA performing the matching during the identification phase. The FIA main window is greyed out and a busy indicator is displayed until the Identification is completed and the output report is saved.

Once the matching process is completed, a dialog window is opened (Figure U11) to save the output report. The user can select the location to save the report as well as change the name of the report. The Identifier report is saved in the pdf format and will be opened after the user has clicked the 'save' button. The identifier report displays the results and the properties of the identification process.

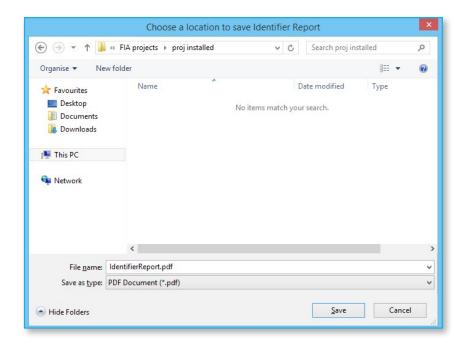


Figure U11: Dialog to choose location to save Identifier output report. The user can change the name of the report. The report is saved in pdf format.

IDENTIFIER REPORT

The identifier report includes the properties of the FIA system and the results of the identification process. The following properties are listed on the first page of the report:

- Crop Height
- · Crop Width
- Crop Position
- Enhancer Active
- Number of Images
- Time and Date

The crop width and height are the sizes in pixels of the images after they have been cropped with sizes varying from 128, 256, 512, 1024 and no cropping. The sensor fingerprint is extracted from the images after the cropping process. The crop position is the location in the image from which the cropping process has been performed. The positions are the top left, top right, centre, lower left and lower right respectively.

The Enhancer Active property is to denote whether the sensor fingerprints of the evidential photos have been enhanced using the proprietary function of FIA. The enhancement cleans the sensor fingerprint of scene contaminations, it is recommended to have the enhancer active during the identification process.

The Number of Images property is the number of evidential images that have been matched against a device fingerprint in the Identifier. The Time and Date property indicates the time and date the Identifier report has been produced.

The Identifier results are displayed in a tabular format, where the thumbnail, file name, results, correlation value as well as the lower confidence bound of the correlation result. The hypothesis that is being tested in the Identifier is:

 H_0 = Image was not created by the camera H_1 = Image was created by the camera

where H_0 is the null hypothesis and H_1 is the alternative hypothesis.

The results column displays a green or red dot depending on whether the null hypothesis (H_0) is rejected or not rejected respectively (Further details about the hypothesis in the FIA documentation). The null hypothesis is rejected if the correlation value in the Correlation column is above a pre-determined threshold. The threshold is pre-set empirically and based on peer reviewed publication in the area of source device identification. If the null hypothesis is rejected, it can be inferred that the photo originates from the device fingerprint being tested. If the null hypothesis is not rejected, it can be inferred that the photo does not originate from the device fingerprint under test.

The Identifier finds the correlation match between the camera reference fingerprint and each photo fingerprint in the dataset and that correlation value is shown in the Correlation column. The correlation results are given to a 95% confidence interval. The column Lower CI (confidence interval) is the lower confidence bound, which means that 95% of the population is above the correlation value obtained.

CLASSIFIER

The Forensic Image Classifier in FIA can be launched by clicking the Classifier button on the evidence page, shown in Figure U12. When the evidential photos are uploaded to the project, the Classifier button will be enabled. Note that a device fingerprint is not required for operating the Classifier. The Classifier requires a minimum of three evidential images in order to run. However, the classifier is designed to clusters a large group of images and a minimum of 10 images is recommended to get a clustering result.

All the evidential images need to be of the same resolution (i.e. same size). If there are images of different resolutions, choose a crop size from the 'Advanced Options' menu

where the crop size is not larger than the smallest image in the dataset. The larger the crop size, the better the quality of the signature, however the operating time will increase (see section Operational Computation). The computation time can be decreased by changing the similarity matrix options and classifier options in the 'Advanced Options' dialog.

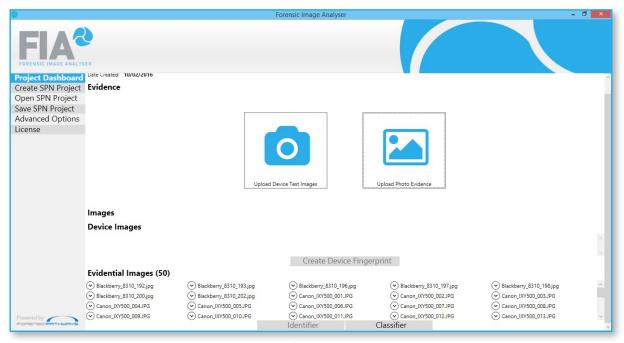


Figure U12: Project evidence page of FIA with the evidential images uploaded.

A similarity matrix is generated in the first step of classification, this matrix contains a similarity matching between all the photos in the dataset. The size of this similarity matrix is set to default values depending on the number of evidential photos that are uploaded to the project. The user can change the size of the similarity matrix to increase the speed of the classification process by decreasing the size of the matrix to 50% or 25%. Note that decreasing the size of the matrix can adversely affect the quality of the clusters produced by the Classifier.

The voting pool size in the classifier options section is set to the default value of using all the images in the similarity matrix during the classification process. The user can decrease the voting pool size by using 50% or 25% of the images in the similarity matrix. Note that decreasing the size of the voting pool size can adversely affect the quality of the clusters produced by the Classifier.

When the Classifier button is pressed, the classification process will start by creating the similarity matrix and then grouping the photos according to their source device. The FIA window is greyed out with the busy indicator displayed as shown in Figure U9, while FIA is performing the classification process in the Classifier. Once the classification process is completed, a dialog window is opened (Figure U12) to save the output report. The user can

select the location to save the report as well as change the name of the report. The Classifier report is saved in the pdf format and will be opened after the user has clicked the 'save' button. The classifier report displays the images grouped in clusters and the properties of the image metadata. Note that the metadata is displayed only if is it present in the image.

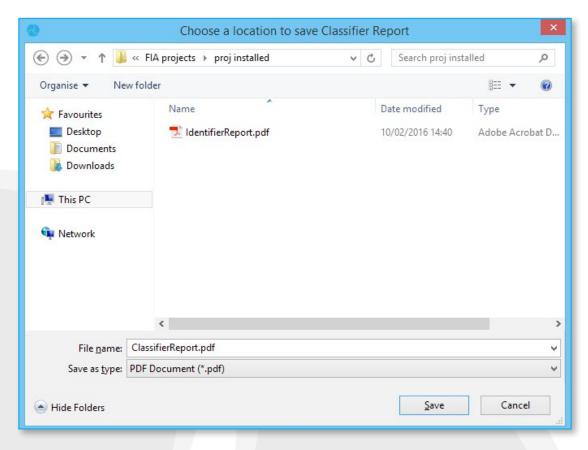


Figure U13: Dialog to choose location to save Classifier output report. The user can change the name of the report. The report is saved in pdf format.

CLASSIFIER REPORT

The classifier report displays the image clusters that are formed according to their source device and the metadata of each image that is clustered. All the clusters are numbered and each cluster corresponds to what the classifier has found to be a source device. The clusters are displayed in a tabular format, where the images are grouped by clusters, i.e. all images placed in one group will be placed in adjacent rows in the cluster results table under the appropriate cluster number.

The table consists of three columns:

- Image File
- Camera Make
- Camera Model

The image file is the evidential image name that was uploaded to the FIA project. The camera make and camera model are obtained from the metadata of the evidential image. If the image has no metadata attached, then no camera make or camera model is displayed. The metadata is not used at any stage of the classification process, it is used for information purposes allowing the user to better understand the clustering results. The clusters are numbered according to the number of source devices found by the Classifier and the clusters are displayed as headers in the Image File column in the table.

In the File Metadata section, the metadata of the evidential images are displayed as a name and value pair, i.e. the metadata property and its value. For example the metadata property 'Camera_Make' and the value 'Canon'. The filename of each evidential image is displayed as a header in the Name column and all the metadata details related to that image are displayed in the adjacent rows. If an image does not have the metadata attached, then no metadata is displayed in the table.

ADVANCED OPTIONS

The 'Advanced Options' dialog window shown in Figure U13, allows the user to change the default settings of certain properties for operating the FIA application. The settings of the properties in the 'Advanced Options' are linked and saved to the respective FIA project they are associated and the options will be set again when the project is loaded.

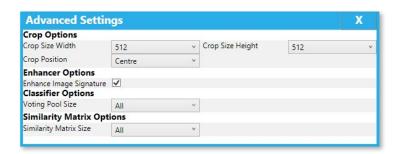


Figure U14: Advanced Options dialog window, where to user can change default settings for operating the FIA application.

The 'Advanced Options' window allows the user to change the:

- Crop Options
- Enhancer Options
- Classifier Options
- Classifier Options
- Similarity Matrix Options

The crop options consists of crop size width, crop size height and crop position, which have default values of 512 pixels, 512 pixels and centre respectively. All the crop size values are measured in pixels. The crop size values can be altered to 'No Crop', 128, 256, 512, 1024 and the crop position has options top left, top right, centre, lower left and lower right. The default values for the crop options will provide a good trade-off between accuracy of the results and computational speed.

The enhancer options allows the user to activate or deactivate the FIA image signature enhancer. The default value is set to activate and it is recommended to always leave the enhancer activated. The enhancer cleans sensor fingerprint of images that are contaminated by scene details.

The classifier options allows the user to change the voting pool size used in the classification process of the Classifier. The voting pool size is set to the default value of using all the images in the similarity matrix during the classification process. The user can decrease the voting pool size by using 50% or 25% of the images in the similarity matrix in order to increase the computational speed of the classification process. Note that decreasing the size of the voting pool size can adversely affect the quality of the clusters produced by the Classifier.

The size of this similarity matrix, in the similarity matrix options section, is set to default values depending on the number of evidential photos that are uploaded to the project. The user can change the size of the similarity matrix to speed the classification process by decreasing the size of the matrix to 50% or 25%. Note that decreasing the size of the matrix can adversely affect the quality of the clusters produced by the Classifier.

FIALICENSING

The FIA application comes with a 30-day trial that starts the day the first install is made. The trial expires after 30 days and the user can view the licensing status of the application and the number of days left of the trial by clicking on the 'License' button in the menu as shown in Figure U15.

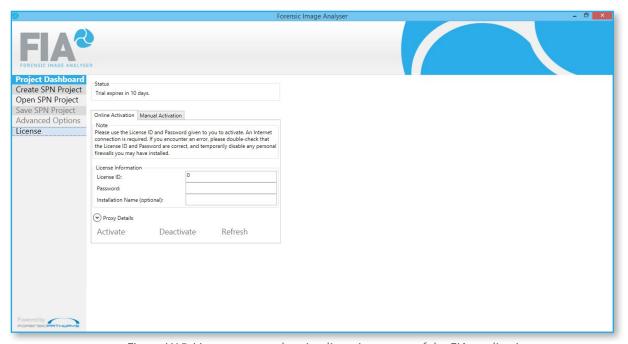


Figure U15: License screen showing licensing status of the FIA application.

In order to activate the FIA application, the user can request a License ID and password from Forensic Pathways. The license information can be entered on the License page, 'Online Activation' tab, as shown in Figure U15 and the application will connect to the licensing website when the 'Activate' button is pressed. The user can also activate the application manually by following the instructions in the 'Manual Activation' tab. Once the application is activated, the status section on the License page will change to 'Fully Licensed' with the License ID displayed.



Forensic Pathways is an award winning company offering innovative forensic technology solutions to law enforcement and security markets globally. Since its incorporation in 2001 the Company has developed a range of forensic technologies focused on forensic digital forensics, image analysis and the management of cell phone data.

Forensic Pathways' core technologies include, Forensic Image Analyser (FIA), Volume Image, Analyser (VIA), Forensic Phone Analyser (FPA), and Forensic Digital Exchange (FDX). The development of such software solutions has resulted in the Company winning a number of awards including the Digital Forensic Award 2015, the Digital Forensic Award 2013 and the Orange National Business Award 2009.

The Company is a signatory to the United Nations Global Compact and its CSR Report can be found on the UN Global Compact website https://www.unglobalcompact.org/ along with its own Company website www.forensic-pathways.com

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