WMP Briefing Paper

Finance Prediction

Ethics Committee (08 February 2023)

> This project is at the proposal stage and is presented to the committee 'in principle' so that any immediate concerns can be raised.
>
> The finer details of the methodology, exact data to be used and mode of communicating the results will not be determined until after the exploratory data analysis (EDA) phase has been completed.
>
> Once the analyses have been completed the project will be presented to the Committee again so that the data used, methodology, findings, intention for deployment and communication plans can be examined in more detail.
>
> Legal opinion has been sought and the Data Protection Impact Assessment (DPIA) is being reviewed by the Force Data Protection Officer (DPO).

Tasking

This project was requested by Beth Tobitt (Strategic Finance Manager) and Davinder Jagpal (Assistant Director for Finance, Contracts and Procurement) in October 2022.

The aim of the project is to enhance the finance capability of the Force by:

- starting to automate the process of creating the Force's medium-term financial plan including sensitivity analysis and scenario planning for changes in economic factors
- starting to look at linking other data sets such as demand, performance metrics and human resources (HR) data to financial data to see what our main cost and demand drivers are
- create cost driver information across the force
- start to automate some of our in-year forecasting to more accurately forecast spend

Purpose

The purpose of the analysis is to enable the Force to make use of forecasting within its financial planning to understand likely future demand. In the context of the current financial environment for policing, WMP is required to find significant savings in the medium term.[1] The intention is to use data modelling to identify future years' gaps by forecasting multiple scenarios to identify where demand may start to outstrip supply. This will enable focus in the right areas in order to help balance the budget in any given year.

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[1] Agendas, Minutes & Reports - West Midlands Police & Crime Commissioner (westmidlands-pcc.gov.uk) (Strategic Police and Crime Board Oct 2022 Agenda Item 6 – Medium Term Financial Plan, p.4)

Context[2]

Nationally, policing is facing economic pressures and West Midlands Police (WMP) is no exception. The Force has the second lowest council tax precept nationally. This combined with a reduction in police grants between 2010/11 and 2018/19 of £175m in real terms has had a far more detrimental impact on WMP than other police forces.

With the additional grant for the national Police Officer Uplift Programme over the last 3 years, the overall funding from 2010/11 to 2022/23 for WMP has increased by roughly 10.8%. This is one of the lowest increases nationally, with the highest increase being 27.7% and the national average for England being 14.6%. These increases do not factor in the impacts of inflation since 2010.

The Force has to make significant savings whilst facing increasing costs due to increased gas, electricity and vehicle fuel prices as well as meeting additional costs linked to the September 2022 pay award for both officers and staff.

Intended activity resulting from the project

The intention is to develop tools to assist the Finance Department in the following areas:

- Automate some manual analytical processes to free up time to analyse and have more meaningful value adding conversations.
- Help to shape the deployment of resources and feed into the national focus on productivity.
- Greater depths of scenario planning analysis and sensitivity analysis to aid proactive decision making.
- Ability to model and plan different scenarios to ensure best value for money and early interventions where costs are potentially escalating.
- Potential for resource savings or a re-direction of resources to enhance the finance service offer.

Ethical considerations

In the context of the current financial constraints, this project aims to ensure that WMP is able to develop financial plans with greater confidence and offer the best value for money to the communities of the West Midlands, using modern business forecasting tools.

The project will make use of finance data, HR data and any other data providing information about the demands placed on the organisation (such as recorded crimes, incidents, custody) and the resources available to meet that demand (such as fleet, officers, staff, estates). Whilst this will include data which relates to individuals (such as victims or WMP employees) it will not require the use of special category data or other details about those individuals. Absence data may be included to understand the impact of sickness or long-term absence (such as parental leave) but individuals' health data will not be required.

The Finance Department will work closely with the Data Analytics Lab (DAL) in the development of the tools and will use the output as an enhancement to their current practices.

The DAL asks the Committee to advise whether there are any further ethical issues of concern that should be considered.

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[2] See the Medium Term Financial Plan for detailed breakdown: Agendas, Minutes & Reports - West Midlands Police & Crime Commissioner (westmidlands-pcc.gov.uk) (Strategic Police and Crime Board Oct 2022 Agenda Item 6 – Medium Term Financial Plan)

Data

Data to be used:

- Finance data - to be provided by the Finance Department

Any other Force systems which give information about either demand or WMP resources – likely to include:

- CONNECT (crimes, custody, investigations)
- ControlWorks (incidents)
- ORACLE (HR data)

Level of analysis:

☑ Individual
   Individuals aggregated?
   ☑ Yes
   ☐ No
☐ Specific Area:
   ☐ Output Areas
   ☐ Super Output Areas - Lower
   ☐ Super Output Areas - Mid
   ☐ Wards
   ☐ Districts
☑ West Midlands
☐ Other (type of crime)

Reliability of data:

An extensive exploratory data analysis (EDA) phase will be undertaken to examine the extent of any data quality issues. The data comes from standard WMP data sources which are routinely used in DAL projects and known data quality issues are accounted for.

Sample or entirety: Entirety

If sample:

Method of sampling: N/A

Method of choosing sample size: N/A

Sample size: N/A

Type of analysis:

☐ Exploratory
☐ Explanatory
☑ Predictive
☐ Optimisation
☑ Dashboard

Proposed methodology:

The following questions will be addressed:

1. How do Finance currently forecast?
2. What are cost areas / factors?

3. How do these relate to demand (crime forecasting)?
4. How does (1) relate to HR data (sickness, etc.)?
5. How does (2) relate to HR data?
6. How do costs relate to estate?
7. How do costs relate to plant (fleet, etc.)?
8. What are the parameters around the sensitivity analysis?
9. Agree term of forecast periods.

Will the project eventually be automated:

☑ Yes
☐ No

Means of evaluation:

Any forecasting of demand will be assessed for predictive accuracy. As the purpose of the project is to enable financial planning, this element will not be testable in the usual sense, however the potential future financial requirements will be subject to the scrutiny of the Finance Department.

ALGO-CARE considerations

As this project is at the proposal stage and is presented to the committee 'in principle' in order that any immediate concerns can be raised, the finer details of the methodology will not be determined until after the EDA. Once the analyses have been completed the projects will be presented to the Committee again so that findings and methodology can be examined in more detail.

Advisory	
If applicable, are the outputs from the algorithm to be used in an advisory capacity?	The output would be advisory. The intention is to offer the ability to include forecasts of likely demand and inform scenario planning as part of the analysis undertaken by the Finance Department when setting budgets.
Does a human officer retain decision-making discretion?	Yes. This information would be considered in conjunction with other information and analysis conducted by the Finance Department.
Lawful	
What is the policing purpose justifying the use of the algorithm (means and ends)?	This project supports the Force Strategy and the Precision Policing Doctrine by ensuring that resourcing decisions are based on data and evidence.
Is the potential interference with the privacy of individuals necessary and proportionate for legitimate policing purposes?	Whilst data regarding individuals will be processed, this would be to produce aggregated data (counts of crimes or types of incidents over certain time periods) as the basic unit of analysis. Therefore, there would essentially be no interference with the privacy of individuals (victim / suspect / offender). HR data will be used to understand the resources available to meet the demand and their respective cost. For WMP resources staff collar numbers will be required as unique reference numbers to understand costs in terms of salary and absences (i.e. maternity, sickness) and relevant department. No further personal data held by the organisation about employees will be used in the analysis. This is a proportionate use of personal data which has been collected for a legitimate policing purpose.
In what way will the tool improve the current system and is this demonstrable?	It is not currently possible for the Finance Department to conduct forecasting analysis based on demand to this level.

Are the data processed by the algorithm lawfully obtained, processed and retained, according to a genuine necessity with a rational connection to a policing aim?	The data are from WMP systems and are collected as part of normal operational and organisational activity. As such data is collected in the appropriate manner and for the appropriate purposes.
Is the operation of the tool compliant with national guidance?	The analyses proposed would accord with the Government Digital Service Data Ethics Framework 2020[3]
Granularity	
Does the algorithm make suggestions at a sufficient level of detail given its purpose and the nature of the data processed?	The output will provide the Finance Department with information to support better budgetary decisions. The level of detail to be agreed (for example to the level of department).
Are data categorised to avoid broad-brush grouping and results and therefore issues of potential bias?	It is unlikely that data will be categorised *per se*, other than into potential demand for various departments (e.g. demand likely to fall on Force Response / Force CID, etc.
Do the potential benefits outweigh any data quality uncertainties or gaps?	The project will include an extensive EDA element and this should highlight areas of heightened uncertainty in the data or where particular gaps exist. There is currently no tool available to help the Force forecast demand in relation to budget and so this tool will reduce the current level of uncertainty.
Is the provenance and quality of the data sufficiently sound?	The data have been gathered during the day-to-day work of WMP and will enable analyses of the type envisioned for this project.
If applicable, how often are the data to be refreshed?	To be agreed with end users – likely to be quarterly.
If the tool takes a precautionary approach in setting trade-offs, what are the justifications for the approach taken?	It is not currently anticipated that trade offs will be necessary (e.g. sensitivity vs specificity), partly due to the nature of the data to be forecasted (integer / continuous as opposed to discrete) and the project will enable scenario identification and planning.

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[3] https://www.gov.uk/government/publications/data-ethics-framework

Ownership	
Who owns the algorithm and the data analysed?	WMP would own the analyses and the data.
Does WMP need rights to access, use and amend the source code and data?	No
Are there any contractual or other restrictions which might limit accountability or evaluation?	No
How is the operation of the algorithm kept secure?	The data and the analyses are contained wholly within the WMP system and the security measures employed therein.
Challenge	
What are the post-implementation oversight and audit mechanisms, e.g. to identify any bias?	Any model which is developed and productionised will have checks included to monitor its accuracy on an on-going basis (the underlying forecasts of demand) as well as any consistent patterns that may represent biases
If the algorithm is to inform criminal justice disposals, how are individuals notified of its use?	Not applicable.
Accuracy	
Does the specification of the algorithm match the policing aim and decision policy?	This project supports the Force Strategy and the Precision Policing Doctrine by ensuring that resourcing decisions are based on data and evidence.
Can the accuracy of the algorithm be validated periodically?	The productionisation of any model resulting from the project would include checking its accuracy on an on-going basis (the underlying forecasts of demand).
Can the percentage of false positives / negatives be justified?	NA

How was the method chosen as opposed to other available methods?	Currently the broad approach has been identified due to the nature of the business question and the data available.
What are the (potential) consequences of inaccurate forecasts?	The main issues arising from inaccurate forecasts would be WMP budgets being allocated ineffectively.
Does this represent an acceptable risk?	Any model arising from this project would seek to balance the advantages against the risks arising from inaccurate predictions partly via balancing the underlying models' predictive accuracy and partly through assessing the types of decisions for which any such model would be effective and any actions that would arise from these decisions. This would be subject to periodic review.
How are the results checked for accuracy and how is historic accuracy fed back into the algorithm for the future?	For any model that was productionised, it's accuracy would be assessed on an on-going basis (the underlying forecasts of demand) via measuring its accuracy so that any degradation of the underlying model(s) could be tracked and the model rebuilt if necessary.
How would inaccurate or out-of-date data affect the result?	This is partly dependent on the nature of any model should one be capable of being built. Generally inaccurate or out-of-date data could detrimentally impact on the models' performance (in terms of accuracy) and lead to inefficient decision making and budget allocation.
Responsible	
Would the operation of the algorithm be considered fair?	During the development of any model, the presence of any biases in the underlying data or for predictions to produce biases would be fully examined and mitigated if the potential was present.
Is the use of the algorithm transparent (taking account of the context of its use), accountable and placed under review?	The development of the model will involve detailed consultation with the Finance Department as the end users. A technical paper will be provided with the details of any model(s) arising and, as mentioned above, when productionised there would be on-going checks as to model performance.
Would it be considered to be used in the public interest and to be ethical?	It would be considered to be in the public interest to ensure that limited resources are used effectively and that WMP can prepare for future demands.
Explainable	
Is information available about the algorithm / decision-making rules and the impact of each feature?	A technical report will be produced which will include information about the methods used and assumptions made. The model(s) will be developed with the Finance Department to ensure they make decisions based on sound understanding of the methodology.

Appendix 1: Glossary of Terms

WMP / Law Enforcement Terminology	
DAL	Data Analytics Lab
HR	Human Resources
WMP	West Midlands Police

Data Science Terminology	
ALGO-CARE	All projects have used the ALGO-CARE to consider ethical implications: Advisory, Lawful, Granularity, Ownership, Challenge, Accuracy, Responsible, Explainable
EDA	Exploratory Data Analysis