

Business Intelligence Strategy

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Document Control

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Foreword

There is no doubt that Local Government is facing difficult times. Years of funding cuts coupled with the increasing costs associated with service provision is forcing councils to reconsider how and what services it provides as well as the level of local tax increases required. This is a particular cause for concern in social care, which, in Havering, accounts for approximately half of the Council's spend. Demand is projected to grow further, with an increasing older population and rising numbers of vulnerable children living in Havering. Rising demand is also due to rising expectations. Not only in social care but in other areas too; from fixing potholes and collecting more rubbish, to providing responsive customer services to a growing and changing population.

Managing this increase in demand is therefore a priority and work has already begun. An approach has been set out in the Corporate Demand Management Strategy which places emphasis on managing demand through early help, intervention and prevention, understanding the key drivers/triggers of demand and being able to identify and respond to them early.

However, to really understand the key drivers of demand, as well as identify additional areas for savings and efficiencies, the Council needs a consistent approach to managing and sharing data and intelligence that will help the Council to understand the needs of its communities better, including those who use, or will use, services and the key outcomes that need to be achieved to improve the lives and experiences of our residents. This will inform crucial corporate strategies such as the Customer Access Strategy and Demand Management Strategy, allowing resources and budgets to be targeted towards key areas and helping to integrate services and/or work in partnership to achieve maximum benefit whilst also achieving savings. This in turn will improve customer service across the organisation, making services considerably more targeted and meaningful for those who receive them.

There is no doubt that achieving this will not be easy; it requires a shift in the way we think and the way we do things, as well as a corresponding change in culture. However, these changes are vital to ensure we are able to deliver high quality services to our communities in the years to come.

Andrew Blake Herbert
Chief Executive

Councillor Roger Ramsey
Leader of the Council

Executive summary

“Business intelligence is about providing the right data at the right time to the right people so that they can take the right decisions”

Nic Smith, Microsoft BI Solutions Marketing

Business intelligence is used for business analysis and planning and is defined as a set of techniques and tools for transforming data into meaningful and useful information¹. It helps to identify new opportunities, to design and implement effective strategies and policies and make evidence based decisions.

By improving the council’s approach to the collation and management of data and developing better business intelligence, the Council will be able to better manage demand, identify savings and make more accurate forecasts for the future both in terms of finance and performance. Improving business intelligence will also enable the Council to better assess future risk and opportunity through data modelling and scenario planning, and communicate this to stakeholders including central government. This in itself provides further opportunities, allowing the council to lobby for more resource with a robust evidence base.

This strategy assesses where we are now in terms of business intelligence and provides a vision for where we need to be in order to continue to meet the demands of our residents and provide good quality services. It sets how we will achieve our vision, both looking internally at how we can improve the way we collect, manage and use data, and externally in terms of what customers’ needs are, both now and in the future.

Whilst there are some things we can do quite quickly, improving business intelligence is a long term process, which is why the objectives in this strategy are organised into short, medium and long term. The Action Plan includes those actions we will achieve in the short term, the intention being that when the Strategy is reviewed, it will re- consider progress against medium and long term objectives. The end game is to ensure the use of business intelligence is embedded across the organisation as ‘business as usual’.

This strategy is aimed at staff who collect and analyse data; decision makers and commissioners; those responsible for designing services, planning for the future and managing demand for Council services; formulating strategy and policy; customer services staff and those who are communicating or consulting with the public.

¹ Vaisman, A. and Zimány, E. (2014) Data Warehouse Systems: Design and Implementation, New York: Springer Heidelberg

Introduction

1. Purpose of the strategy

This strategy sets out how the Council will improve business intelligence in the short, medium and long term to get the best outcomes for both customers and the organisation. It will look at the way data is collated, held and used by the Council and how this can be improved focusing on systems and processes and people and culture.

The Strategy also outlines key areas that are integral to improving business intelligence, including transparency and open data, customer insight, operational intelligence and data quality.

Systems & processes

The strategy sets out how systems and processes will be put in place to gather, collate analyse and share data and other insight held by the Council and its partners. For example, the Council will develop a single centralised point where data relating to residents, properties and businesses will be held, the Data Warehouse. This will ensure consistent representation of communities and their issues and needs. The strategy also sets out how a new performance management system will improve performance monitoring and management at the most strategic level and contribute towards a better understanding and use of business intelligence.

People & culture

Alongside this, the Council will develop a culture where data, information and knowledge is routinely captured, shared and used to inform evidence based commissioning and decision-making. This will include having the right skills in place within the workforce to analyse and interpret data and make it meaningful to others.

The LGA report² on demand management states that:

*“...achieving behaviour change requires joined-up thinking and understanding. Demand management often depends on co-ordinated action from a range of providers, and the first step is to share data to build up a rich picture of customer circumstances. Combining data in this way creates intelligence, which will allow resources to be saved or more effectively targeted. However, **sharing data in a timely manner requires senior leadership and sponsorship** to overcome blockages. It is essential to set the expectation that data is a critical asset. Organisations need to recognise the value of the data assets they have, and the added value generated from combining them.”*

This strategy is seeking to create the right environment and culture to allow this to happen.

² Local Government Association (2013) Managing customer demand: Understanding and changing behaviours to help meet the financial challenge

Transparency and Open Data

Transparency refers to how open the Council is about its business and performance. Open data refers more to the specific ways in which data is published – both in terms of how it is licenced and how it is formatted.

There are significant benefits to be realised from becoming a more open and transparent Council including creating a more inclusive democratic process, increasing trust in the Council and allowing third parties to use data which can both decrease demand and stimulate the economy.

Increasing transparency and open data is embedded in this strategy and a road map to becoming a more open and transparent council is included in Annex B.

Customer Insight

Customer Insight (CI) is a key element of business intelligence and this strategy incorporates this within each section, the aim being to embed effective use of customer insight and segmentation into service design, decision making and commissioning. Customer insight is the broad term used to describe the analysis of a range of data about residents to better understand their needs, expectations, behaviours and experiences.

Customer insight is used to:

- Understand the needs, wants and preferences of customers to target services appropriately
- Take decisions on service levels, service location and resource planning
- Target communications by understanding how households prefer to receive communications
- Inform service delivery by understanding how households currently interact with the Council and wish to do so in the future– This helps with channel shift, including
 - Increasing service take-up, for example, paying Council Tax by direct debit
 - Decreasing service use, such as face-to-face contact
 - Advising residents about particular services, such as grants or equipment and adaptations.

Operational intelligence

Operational Intelligence (OI) is also a key element of our approach to business intelligence. Effective OI provides data relating to operational activity in real-time, at the most granular level possible. It enables the monitoring of business activities and the identification of inefficiencies and opportunities in relation to business practices.

Understanding of this data facilitates the development of evidence based operational solutions. It also serves as an evidence base for organisational change programmes.

Data Quality

Good quality data is the foundation to improving business intelligence and making evidence based decisions. It is also central to becoming a more open and transparent council, and improving our approach to operational intelligence and customer insight.

Data quality will improve as more information is added to systems such as the data warehouse and new performance management system, and the Council takes steps to become more transparent through making additional information publically available. However, a culture of good data quality needs to be driven by senior management and active steps taken to improve data quality across the organisation where it is known to be poor or where there are known to be several versions of the 'truth'. The council also needs to promote the message that data quality is fundamentally the responsibility of every individual who works with data.

A Data Quality Policy is included as Annex A which sets out Data Quality standards and guidelines for the organisation.

2. Scope of the strategy

The strategy focuses on having the right systems, processes, people and culture in place to exploit data fully. It will not focus on information governance, as there is a separate framework and governance structure (the Information Governance Group) to ensure that data is:

- held securely and confidentially
- obtained fairly and lawfully
- recorded accurately and reliably
- used effectively and ethically and
- shared appropriately and legally.

Although these elements are out of the scope of this strategy, they are fundamental to its implementation. There are also strong links across other strategies, such as the Corporate Demand Management Strategy, and frameworks including the Policy and Strategy Development Framework, Consultation Policy and Corporate Performance Framework.

Where are we now?

We make use of data for a variety of purposes across the Council. This includes those below and many other strategic documents:

- Joint Strategic Needs Assessment (JSNA)
- Corporate Plan and Service Plans
- Children & Young People's Plan
- Local Development Framework and the emerging Local Plan
- Housing strategies
- Community Safety Strategic Assessment and problem profiles
- Sharing of information in the MASH, MARAC etc.
- Local Economic Profile

The Council has taken steps to improve its ability to target and shape services and communications according to the needs of different resident groups, resulting in more efficient service provision. It has used the Mosaic population segmentation tool (developed and owned by Experian Ltd), which classifies households into segments according to their demographic, socio-economic, lifestyle, attitude and consumer characteristics. Mosaic is used across central and local government, the NHS and police forces to target services more effectively and efficiently, and the Council has used it to develop a deeper understanding of its residents' needs and preferences.

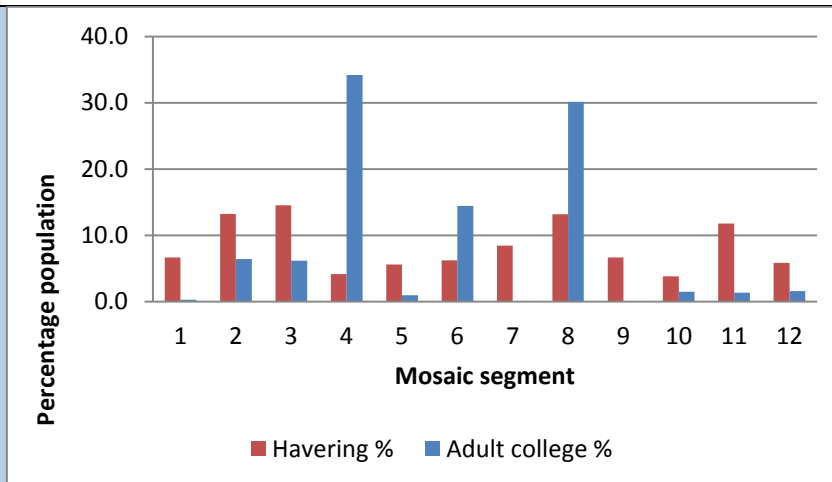
CASE STUDY: HAVERING ADULT COLLEGE

Objective: The Curriculum and Strategy Manager wanted to understand how MOSAIC might be used to support a marketing campaign for the Adult College. In particular,

1. How the MOSAIC profile of the Adult College customer base compared to the wider Havering population?
2. How marketing of the Adult College might be targeted in a more strategic and efficient way?

Approach: The Adult College customer database was cross-matched with the MOSAIC postcode directory enabling a profile of customers to be generated. This showed the distribution of customers across the 12 MOSAIC segments.

Findings: It was found that the majority of college students fell into segment 4 - categorised as middle-aged, ethnically diverse individuals, living in terraced houses with some degree of deprivation. The customer profile was then compared to the profile of the borough as a whole. As can be seen in the chart below, customers that fell into segment 4 were more highly represented (8x) than in the Havering profile. The findings also illustrated which segments of the Havering profile were not being engaged.



Evaluation: The analysis supported the Adult College with their strategic planning and management - specifically to plan, cost and target the marketing of new courses, as well as implementing a new course programme to attract a more diverse customer-base.

The Data Intelligence Hub has been utilised as a vehicle to share key demographic and socio-economic data about the borough, but this has not helped us in linking and sharing local data to gain added benefits. For example, at the end of July 2013, the Council received an unprecedented number of new applications for school places. This placed considerable pressure on local schools to accommodate significant numbers of new pupils and on the Learning and Achievement Team to process applications and place children quickly. As a consequence a specific piece of work was needed to analyse the key drivers of this demand.

The Corporate Brain programme was instigated in 2013 to look at (amongst other things) how the Council could better use data and other business intelligence to inform decision-making and commissioning. The programme is focused on three workstreams to improve outcomes and services for local people – business intelligence; business planning, and managing demand and behaviour change. The programme identified early on that information was required to inform commissioning and help the Council respond to financial pressures through making evidence based decisions. As part of this, there is support for creating a more data driven culture across the organisation.

Since the instigation of the Corporate Brain programme, the Council has set up a Data Warehouse that will help address existing gaps by linking datasets together and providing access through one single centralised point. Further data needs to be added to the Data Warehouse to make it effective and it still needs to be embedded across the Council. The need for a performance management/business intelligence platform was also identified, which will not only streamline performance reporting processes, but will assist services in developing better operational intelligence, providing opportunities to identify efficiencies and improve performance. The procurement process for this system is now underway.

This strategy seeks to build upon these secure foundations and move the Council towards making better use of the data held. Alongside the use of this data there are other issues about the data that this strategy seeks to address, for example:

- Official data sources are out of date and there are often time lags in collecting and distributing data
- The granularity of official data is poor
- Data often relates to usage rather than need
- Proper evaluation of services and decisions is difficult, and
- Some current Council data sets are incomplete, inconsistent or – at worst- contradictory.

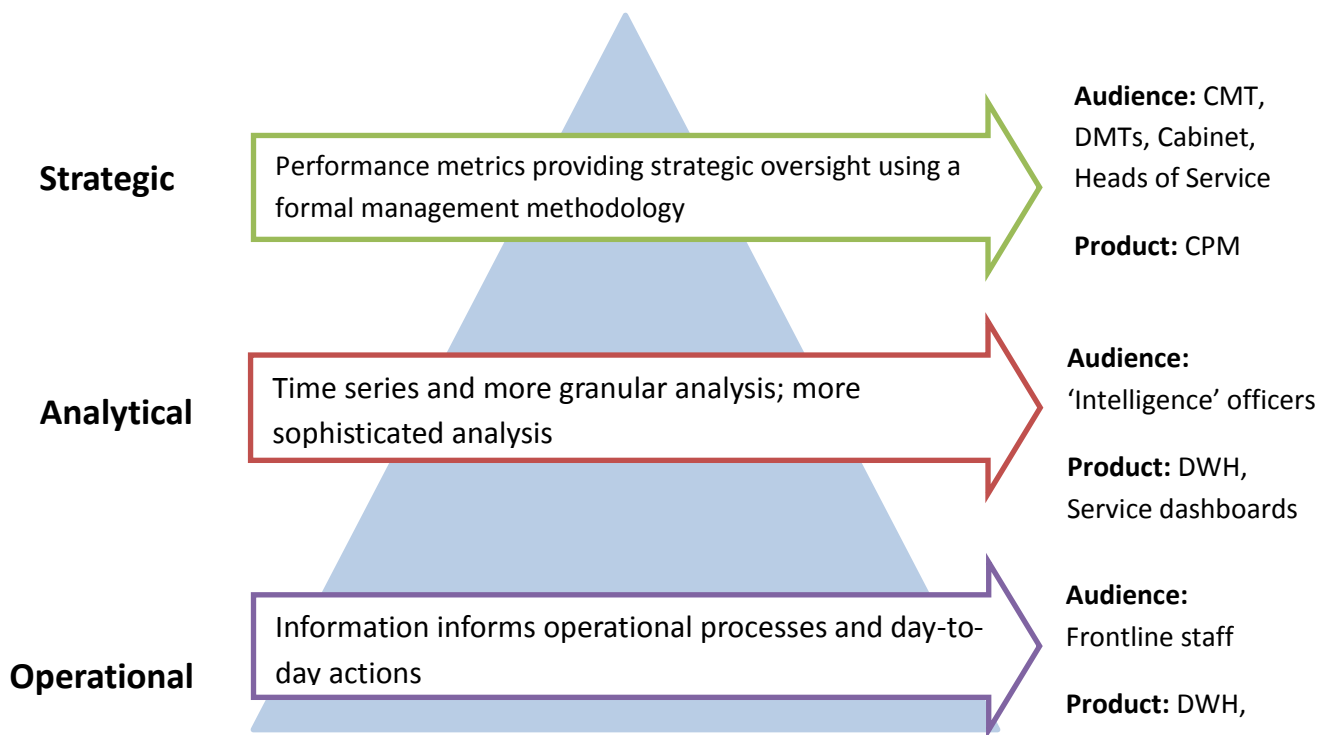
Where do we want to be?

Vision

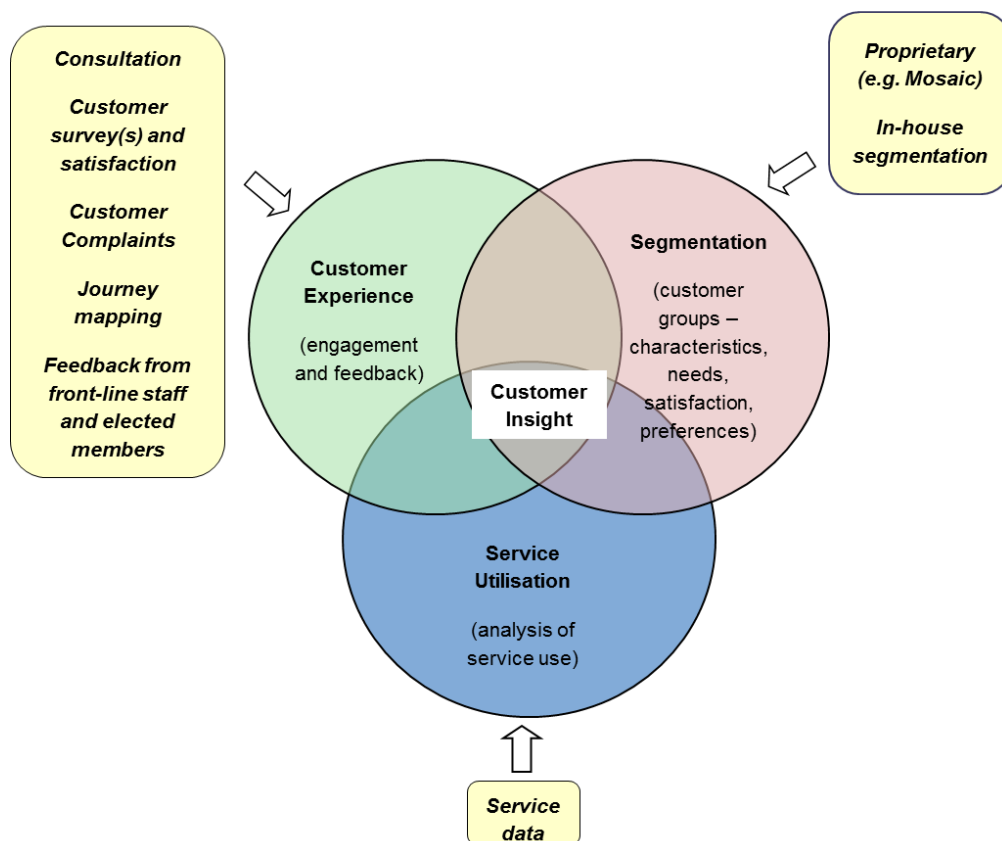
The vision is to transform the way the Council identifies, assembles and utilises data and information to make evidence based decisions – resulting in better outcomes and financial savings. Information will be treated as an asset and used to maximise benefits to the Council and its residents. This will require a change in culture to one where data, information and knowledge is routinely captured, shared and used.

Embedding the use of operational intelligence, supported by good data quality, is integral to achieving the vision. Progressing beyond the simple use of Excel to store aggregated performance indicators, data will be extracted from source systems at the most granular level possible and analysed across varying dimensions (e.g. time and geography) to provide a more nuanced understanding of operational practices. The application of statistical techniques such as Statistical Process Control charts will be introduced to provide greater insight into the work that contributes to towards the Councils intended objectives. Data analysed will form the foundation of the evidence base that drives organisational change programmes, our approach to demand management and the service and corporate planning process.

This diagram shows three levels of business intelligence. Delivery of this strategy will improve intelligence at all 3 levels. For example, a new Corporate Performance System will improve operation intelligence at strategic level, whereas the Data Warehouse and subsequent interfaces will provide intelligence at the analytical and operational levels.



Embedding the use of customer insight, again supported by good data quality is also a key enabler to achieving the vision. Implementation of this strategy will ensure that data from multiple sources is brought together and analysed to provide meaningful and actionable insight – see diagram below:



Customer experience - the Public Consultation Framework incorporates a policy and toolkit that supports consultation and analysis. A new corporate complaints policy and

procedure has recently been implemented that will enable the Council to capture data more effectively, learn from complaints and make service improvements.

Segmentation - is the process of subdividing the population into homogenous groups with shared needs and characteristics based on who they are, what they do and how they think and feel. This will help the Council to understand the differences between communities and enable more effective targeting and tailoring of services.

Service utilisation – data comes from service users in a variety of ways. Greater efforts will need to be made to understand the reasons why people are not using a service.

The Government-funded customer-led transformation programme 2009-2011 (see LGA evaluation report November 2013) identified a range of benefits that could be delivered through effective customer insight, including :

- **For residents** - better targeting of services; reduced impact on demand and need; improved customer support; improved customer service and outcomes; behaviour change and empowerment and resilience
- **For the Council** - improved policy-making and better adaptation to policy changes; better, more targeted service delivery; culture change; better joining up between services; greater engagement with customers through various consultation measures; innovative design of services; increased customer satisfaction
- **For partnerships:** reduced waste/duplication of data and services; improved partnership working; innovation; culture change externally; shared learning and collaboration; greater mutual respect/trust

There are also financial benefits such as savings, income generation, benefit take-up and avoidance of costs as a result of early intervention, prevention or behaviour change. For example, the Council is planning to use the Data Warehouse to develop the required evidence base (by bringing together data relating to complaints, fly tipping, anti-social behaviour, noise nuisance and the like) to introduce a licensing scheme for private sector landlords in areas where intelligence identifies current issues in respect of poorly kept properties. This will reduce demand on Council services by making landlords more responsible for the behaviour of their tenants, thereby addressing the causes (as opposed to the symptoms) of demand drivers. The Council is also planning to introduce mobile technology in the form of an “in-cab” system in its vehicles which will deliver a more efficient, intelligence led service that targets resources in a more effective way. By interfacing between the Council’s Customer Relationship Management (CRM) system and the vehicles, this will allow staff to record fly tipping incidents in real time, reducing paperwork and producing more accurate data on which to plan and deliver services. This improved intelligence will also allow officers to allocate enforcement surveillance efforts more proactively and intelligently, which will assist the Council in bringing more offenders to justice.

Customer insight will be embedded into service design, planning and delivery. It will inform strategic discussions and be a stimulus for collaboration, innovation and co-design of services with partners and service users.

Principles

The general principles that underpin this strategy are:

- To collect data once and use it many times
- To extract data from source systems at the lowest possible level of granularity
- To establish one version of the truth across the Council and ensure consistent use of information
- Robust, accurate, data will be available to make evidence based decisions and inform commissioning and strategy
- Data will be of good quality
- That information is targeted/personalised to meet the needs of the Council, residents and partners
- Wherever possible, data will be used to predict events and forecast trends not just identify them, thereby helping the Council model different scenarios and manage future demands on services
- Only data that is meaningful, actionable and will underpin delivery of the Council's priorities as set out in the Corporate Plan will be produced and interrogated
- Information and data will be shared in the Council, with partners and the public unless legal restrictions prevent this. Where this cannot take place there will be clarity about why this is the case.
- Data made publically available will be published under an open licence to encourage use and re-use, where appropriate.
- Sensitive information will be managed safely, so that sharing can be carried out with confidence, and in line with our legislative obligations
- Where data is used, the source, dataset used and the date of the data will be referenced

In addition there are a number of principles specific to Commissioning:

- Commissioners stay up-to date with relevant evidence, using it intelligently to inform commissioning decisions and map the needs of the population and the existence, nature and distribution of people's requirements as well as any gaps in the markets ability to respond to these
- Data is produced in a form and timescale that is useful to commissioners, which will also depend on commissioners defining their data and knowledge requirements accurately and expediently

- There is demonstrable collaboration and sharing of qualitative and quantitative data across the different agencies and services, notably within social care, health, housing and education, which is used to establish a baseline; inform commissioning decisions in a clear and transparent way, and evaluate their impact.
- Commissioners and analysts employ a wide range of methods to collect, understand and analyse the views of people who use services, and will demonstrate that this evidence strongly informs commissioning priorities. This qualitative analysis is important to assess if outcomes meet local needs, and has been the focus of our work on a review of the consultation guidelines.
- There will be capacity and skills to undertake the analysis necessary to interpret local data and wider evidence in a meaningful and relevant way including the ability to tackle the underlying causes and preventing future needs arising.
- Commissioners will effectively use evidence for performance management and evaluation of outcomes, and have evidence-based quality assurance systems to provide accurate, accessible and timely information to support better contract monitoring and decision making

Objectives

Progression in this area will take time and it is not possible to jump straight from our current position to an ultimate end goal. For that reason, objectives around systems and processes, the development of skills and culture change are categorised into short, medium and long-term goals below:

Theme	Short-term (next 12 months)	Medium-term (next 1/2 years)	Long-term (next 2/3 years)
Systems/ processes	A Corporate Performance Management system is developed to improve the efficiency, accuracy and intelligibility of the corporate performance reporting process and its associated products		
	A single view of the customer, household, property and business – using unique identifiers to link datasets – and access to the single view via an easily accessible corporate Data Warehouse		
	An approach to transparency and open data is agreed and action plan put in place.		
		A Data Warehouse interface is developed to provide easier, more insightful access to the Data Warehouse	
		Service specific dashboards are developed through the Performance management system to generate operational insight, identify potential efficiency savings and inform organisational change	
People (skills)	Data used for analytics is more timely and accurate due to the development of an effective business intelligence stack		

		Knowledge of significance testing, confidence intervals and similar techniques developed and embedded across analysts	
			Predictive analytics are used to develop strategies for early intervention and for more effective targeting of resources
Culture	Business intelligence is inexorably linked to corporate priorities and its subsequent development is conducted in line with these priorities		
		Robust intelligence is embedded into demand management and performance management activities across the Council	
		Every analyst and manager is using the single view	
		Analysts and commissioners work closely to ensure robust intelligence is in place to inform commissioning decisions.	
			Robust statistical procedures (e.g. significance testing, confidence intervals, SPC charts) become an accepted part of BI and performance reporting
			A culture of using the Data Warehouse to answer complex questions is embedded across the Council

The **anticipated benefits** of achieving these objectives are as follows:

- Data and intelligence will underpin commissioning and other decisions to support our approach to managing demand and investing in early help, prevention and early intervention, which will both improve outcomes for local people and avoid costs which might otherwise have arisen
- There will be easier and faster sharing of data between departments and outcomes will be improved with limited resources - thus improving performance and value for money. This will help remove departmental silos and join up services in a manner that recognises the needs of the population, getting away from traditional working practices
- The Council will have a better understanding of what works and be able to improve its learning.
- The Council will be able to leverage existing expertise in a more positive way
- Increased transparency and open data will improve public access to information, help the public hold the authority to account, drive efficiencies and promote innovative use of data as well as economic growth.

All these elements are the focus of this strategy and will need to be in a place to support a more strategic commissioning framework.

How we will get there?

Objective 1: Systems & processes

Systems and processes will play an invaluable role in helping to deliver this strategy, although they are only a part of the overall solution. For example, technology can help the Council and its partners to identify those most in need of support, through the analysis of demographic and socio-economic data, often on a collaborative basis across a number of agencies or, in the case of troubled families, by identifying the families most in need. This can be, for instance, by enabling socio-economic data and information on existing interventions from a range of public service providers to be collated and analysed.

Through the use of ICT, including through the Data Warehouse, Data Intelligence Hub and new Performance Management System, business intelligence will be:

- Easy to access and analyse through the provision of easy-to-use interfaces for staff – these will facilitate consistent data and the sharing of data between departments and agencies. Interfaces will be tailored to meet different business and user needs
- Easy to store and retrieve through an effective Data Warehouse linking-up local data from separate business systems across the Council and consolidated into one data source along with key JSNA, Mosaic and national/regional/local authority level data sets

- Utilising the most granular level data to enable better monitoring of business activities and opportunities to improve service delivery as well as realise efficiencies and savings.
- Publicly available where possible/appropriate
- Available through a single view of the customer/property/business
- Standardised for warehouse designers and developers

Objective 2: Policies

Many of the policies that support this strategy, such as information governance, are within the remit of the Information Governance Group. Policies and protocols will be reviewed to ensure that they support the objectives of this strategy. Staff will be very clear on what constitutes good data quality and why this is important, what data can be shared, with whom and how.

Guidance on data quality and data sharing will be in place as well as training. All information that has restricted/authorised viewing will be classified as such and measures will be in place to protect this. Information/data sharing protocols will be in place supporting sharing and use of data and will be collected and maintained in one place for ease of reference.

Revised public consultation guidelines will be put in place and embedded, which will help us with our qualitative analysis – this is a key element of the commissioning process

Objective 3: People

New skills will be required to ensure that everyone who needs to, has the skills to access and exploit data contained in the systems, including the ability to use the ICT tools for finding, using, creating and sharing information. The implementation of the strategy will require a considerable investment in skills and training. This will be at different levels for strategic; tactical and operational users.

Strategic users – Review key performance metrics aligned to the strategic goals of the organisation. In doing so they provide oversight and management of activities; for example aligning financial information, resource information and performance information with key corporate goals.

Tactical users – Utilise time series and granular level data to undertake more sophisticated analyses. The insight and intelligence generated by analytical users provides a more thorough understanding of the business and can be used as the evidence base for the creation of new strategies and re-focusing of services.

Operational users – Access data to inform operational processes and specific actions. Although no sophisticated analyses are undertaken at this level, access to real-time high quality information enables these users to plan and target their resources more effectively on a day-to-day basis.

Statistical skills will need to be developed to improve the robustness of quantitative analysis. Further statistical skills in predictive modelling techniques will need to be developed and maintained to ensure that the potential benefits of the data warehouse and other tools are fully realised.

Objectives will be set for relevant staff in performance development reviews that take into account the objectives of this strategy and consider how they can utilise business intelligence to improve services and outcomes. Staff will add value by filtering, synthesising, interpreting and adding context to data collected. Analysis of data will draw out actionable insights.

The strategy will not be confined to data in systems – it also covers the tacit knowledge residing in individuals and will encourage interaction and communication between people to make that knowledge explicit and accessible.

The action plan will address how the Council grows demand for intelligence rather than reacting to individual issues, enabling more systematic planning to meet needs and manage demand.

Objective 4 - Culture

Use of business intelligence will be embedded within the Council to support delivery of overall priorities. It will underpin the delivery of those priorities, and commissioners and programme and project managers will be expected to understand the relevance of and use business intelligence to inform decisions. To assist with this change in culture the Council will:

- Ensure that leadership from the top of the organisation promotes a commitment to the development and use of the tools, skills and values required for effective business intelligence including advocating the importance of good data quality.
- Develop and deliver a communications strategy around business intelligence to change organisational practices in a manner required to achieve objectives.
- Make greater and more sophisticated use of benchmarking to increase our knowledge of how our performance compares relative to others, where we need to improve our practice, and to set challenging future targets
- Collate and analyse data and other intelligence more proactively and in accordance with corporate and service needs, rather than reactively in response to ad hoc requests wherever possible
- Ensure the service planning and performance management processes will reinforce the need to take relevant data into account in decision making and when commissioning.
- Promote the importance and benefits associated with transparency and open data

How will we know when we get there?

The Corporate Brain Programme Initiation Document (PID) identifies the following key success factors:

- To have a Business Intelligence Strategy that is ratified by SLT and implemented.
- To have a corporate Data Warehouse providing a single customer, household/ property and business view drawing on data from business systems across the organisation
- To have a suite of interfaces for the Data Warehouse tailored to the needs of different business areas and users, which are available on desktops via app-V.
- To have a Council-wide understanding that the Data Warehouse is a resource that can help them solve problems
- For all analysts to be using the Data Warehouse.
- To have increased analytical skills and capacity across the organisation to undertake more robust descriptive analysis and generate greater insight through the application of predictive analytics

Improved use of customer and operational insight will have helped us to achieve efficiency gains and improve outcomes for local people by targeting local services more effectively and building them around the needs of citizens. Performance Indicators/ critical success factors include:

- More efficient match between need and provision
- Reduction in avoidable contact (getting it right first time)
- Identification and removal of operational inefficiencies
- Lower cost to provide services
- Increased customer/resident satisfaction
- Better resident/customer/business engagement
- Reduction in complaints from full reviews of the Customer Experience
- Reduction in FOI requests
- Better understanding of the ways different groups of residents (e.g. vulnerable / hard-to-reach groups) prefer to engage with the council, resulting in greater and more representative resident participation in consultation and engagement exercises
- Better targeted campaigns and resources
- Service provision better targeted to channel preference
- One warehouse for Council data including access to consultation and survey data.
- Better understanding of organisational performance

Related documents

The strategy should be read in conjunction with the Policy & Strategy Development Framework; Public Consultation Policy; Corporate Performance Framework; Communications Strategy; Corporate Complaints Policy and Procedure; Demand Management Strategy; Information Governance Commitment Statement

Consultation

This strategy has been produced in consultation with the Corporate Brain Steering Group, the members of the Information Governance Group and commissioners.

Authorisation and communication

The strategy has been authorised by the Senior Leadership Team (SLT) and will be communicated to staff through implementation of a communications strategy, as set out in the action plan.

Implementation and monitoring

See Action Plan on page 34.

Evaluation and review

The Corporate Brain Programme Plan will be amended to reflect key issues identified in the strategy and delivery will be monitored through the Corporate Brain Programme.

The Strategy will be fully reviewed and amended as necessary in 2019.

Further information

Contact the Policy & Performance Service through the relevant Business Partner:

Children, Adults and Housing – Craig.Benning@Havering.gov.uk

Chief Operating Officer and Neighbourhoods (formerly Communities and Resources) – Kayleigh.Walker@havering.gov.uk

For queries relating to the Data Warehouse, Data Intelligence Hub and Consultations, contact the Customer Insight Officer – Mark.Holder@havering.gov.uk

Annex A - Data quality policy

Delivery of this strategy is dependent on having accurate data. The Council relies on this for monitoring and improving performance, setting budgets, preventing fraud, commissioning services, protecting vulnerable people and making informed policy judgements. Quality data underpins the idea of making better use of information to support service delivery. The aims and objectives of this policy are to:

1. Instil a sense of confidence in the quality of our data
2. To reduce errors and improve accuracy and reliability of data
3. To provide a framework to ensure these standards are met and to embed a culture that advocates data quality and effective management of information across the Council

Scope of the policy

For the purposes of this policy, data is defined as the key data used by the Council to monitor its financial and service performance, and as the basis for decision-making. This applies both to information that we use ourselves and which we share with others. This includes:

- Financial information;
- Data supporting performance measures and applying to statutory performance indicators and local indicators reflecting service priorities
- Customer/service user data, including market research and data derived from surveys and consultation activities
- Socio-economic and demographic information that is used to inform policy and decision-making processes
- Information used by managers to monitor and manage service delivery where the Council is dependent on the regular collection and maintenance of quality service user data to provide an efficient and effective service
- Information provided for internal management and external reporting purposes
- Information that will be shared with or received from other agencies.
- Information that is published in print or via the web.

All teams working to deliver a service that the Council is accountable for providing or commissioning will adhere to this policy and will take practical actions to apply it to improve and maintain robust data quality, and will apply the general and specific guidelines that have been set out. This includes service areas that are directly provided by the Council, and delivery partners who have been commissioned to provide a service or function on the Council's behalf.

Data quality characteristics

This policy aims to ensure the achievement of quality data by requiring the following:-

A. Accuracy

- Data will be sufficiently accurate for its intended purpose and provide a clear and robust representation of the activity / interaction and performance
- Data will be captured only once and as close to the point of activity as possible
- Data will be checked at the point of collection wherever possible
- Data will be in sufficient detail for its intended purpose and to enable informed decision making at all levels
- The costs and effort of collection will be balanced with the importance of the data, time requirements and the need for accuracy
- Where compromises have been made to accuracy for valid business reasons, for example where some data is estimated, this must be made clear to data users

B. Validity

- Data will be recorded in an consistent format and used in accordance with agreed requirements, rules and definitions to ensure integrity and consistency
- Where proxy data is used to compensate for actual data this must be made clear and satisfy the intended purpose of the data.

C. Reliability

- Data collection processes will be clearly defined and stable over time (where appropriate) to ensure consistency and comparability of data
- There will be clear instructions in place at service level for the collating and reporting of data to ensure consistency, particularly in cases of staff turnover
- There should be confidence that statistical trends reflect real changes rather than variations in data collection approaches
- Data/information must be from primary sources wherever possible
- Processes should minimise manual intervention and maximise the automation of data collection and manipulation in order to reduce the risk of human error

D. Timeliness

- Data will be collected and recorded as quickly as possible after the event or activity

- Data will be available for the intended use within a reasonable or agreed time period and quickly and frequently enough to support information and decision needs

E. Relevance

- Data will be relevant for the purposes for which it is used, proportionate to the value gained from it, and will provide the answers required
- Contextual information should be collected only as far as this is required to support the process or activity
- Where the data was collected for a different activity, quality assurance and feedback processes relevant to the required activity are needed to ensure the quality of such data
- Requirements should be clearly specified and regularly reviewed to reflect any change in needs

F. Completeness

- Data collection processes should be clearly specified and matched to the information needs of the organisation
- Data should be complete and not contain redundant or duplicate records.
- Missing, incomplete or invalid records or fields should be minimised and must be monitored as they indicate potential recording problems or other issues impacting on data quality

G. A clear audit trail

- A documented process for obtaining and using the data, which is understood by all involved in producing the data, and is accessible to those who rely on or have an interest in it

General guidelines

To protect the quality of data used across the Council and its partnerships, the following guidelines should be adhered to by all officers:

- Responsibility for data quality must be clearly assigned by line managers and everyone must understand their individual responsibilities. Data quality responsibilities should be included in job descriptions where appropriate.
- Staff at all levels in the Council must recognise why data quality is important and that it is 'part of the day job'.
- Systems, processes and controls must be fit for purpose and operate according to the principle of 'right first time'. Standard methodologies for

collecting, processing and storing data should be in place, written down and easily accessible by colleagues. Manual data capture or process intervention should be minimised.

- All council teams must be transparent about the data they collect and areas in need of improvement. They will engage constructively with any improvement activity that is initiated.
- Adequate and effective controls must be in place during the input, reporting and publication of data to ensure the quality of the data is maintained.
- Each service will ensure spot checks of data will take place on a regular and planned basis.
- Clear and complete audit trails must be maintained to demonstrate accuracy for all data used for decision-making internally or reported externally to government. These will also be supplied to the Internal Audit and Policy and Performance teams upon request, and are open to constructive challenge.

Purpose of data	Why data quality is important	Guidelines for officers
Service delivery	The delivery of services, from waste collection and disposal to housing, child protection and adult social care, is dependent on the intelligent use of high-quality data. This is because data is used in order to direct resources to areas/families most in need, to identify new and emerging trends and issues, identify savings etc.	<ul style="list-style-type: none"> • Relevant front line staff must be trained on the importance of inputting accurate data. • Data must be collected, processed and shared in compliance with the Data Protection Act. • Where appropriate there should be appropriate and clear process maps and methodology statements in place for the consistent collation of data. • Only relevant data should be collected. Service users will not be asked unnecessary questions
Strategic planning	To plan effectively for the future, we need high-quality data that allows us to understand what the most important strategic challenges are, what resources we have available to meet them, and where there are gaps. We need to be assured that the decisions we make now are the correct ones based on good	<ul style="list-style-type: none"> • There must be clear processes in place for aggregating service-level data and reporting it to key audiences • Clear communication must explain the need to produce high-quality data • Benchmarking data should be used appropriately to allow us to identify areas of weak or strong

Purpose of data	Why data quality is important	Guidelines for officers
	<p>quality data. It also allows us to compare how we are doing with other organisations and to identify areas of our performance that we need to improve.</p>	<p>performance.</p> <ul style="list-style-type: none"> • Assurance of accuracy must be given by the data owner on all data that will be used for strategic decision making or planning • Clear requirements and consistent standards must be in place for the use of data.
Supporting service delivery	<p>Managing a large organisation like the Council involves a wide range of activities that enable the delivery of effective frontline services. This includes managing Council buildings and staff, maintaining efficient and effective information systems, understanding the risks that affect us, developing and managing contracts with our delivery partners, procuring services and assets on behalf of residents, and ensuring that we have the necessary resources in place and correctly allocated to make all of this possible. All of these activities and many more require good quality data.</p>	<ul style="list-style-type: none"> • Managers understand the need to keep up-to-date data and accurate records e.g. staff absence. • Services and contracts must be developed, monitored and evaluated using relevant, measurable and up-to-date data. • Senior managers must initiate and action research to identify areas of poor data quality and deliver improvements. • All staff and delivery partners understand that data quality is everyone's business. • All data is collected and managed in line with legal requirements.
Oversight and governance	<p>It is important that councillors and senior officers are able to have oversight of the way the Council's services are being run, and can take action as soon as any problems are identified.</p> <p>This could include overview and scrutiny committee meetings, and Cabinet and management team meetings. The Council's Policy and Performance team also has an oversight role for spot-</p>	<ul style="list-style-type: none"> • All data produced has an owner with responsibility for ensuring the quality of that data. • All data given to decision making bodies (e.g. Cabinet) must be signed off by a senior officer prior to publication. • Data collected / inputted at service level should have a clear methodology in place.

Purpose of data	Why data quality is important	Guidelines for officers
	checking the quality of data and facilitating improvement. Internal Audit will provide assurance to key stakeholders as to whether this policy has been applied.	
Accountability and transparency	The final need for good quality data is so that the Council can be held to account for the services it provides, for instance through the publication of our accounts, performance, risk and HR data, and through FOI requests. This allows residents to engage with the democratic process, to ask questions based on the data and the Council to give robust responses based on high quality data.	<ul style="list-style-type: none"> • Where possible data produced by the Council should be available to be published in support of transparency. • Data released in response to FOI requests should be prompt, of consistently high-quality, and relevant to the question asked

The Council expects different service areas, including those directly delivered by the Council and those delivered on its behalf, to utilise the model below when implementing this policy.

Officers who will be the primary users of data, for instance for policy making, commissioning or resource allocation purposes, are responsible for defining the data requirement and for setting out quality criteria. The collectors of that data and their managers will ensure the definition and quality criteria are complied with and that control measures are applied effectively.

- **Collectors of data** - Apply criteria; collect data; input data; map processes; challenge and correct data when required and ensure data quality
- **Primary users of data** – Define requirements; agree data quality criteria; challenge the quality of data and feedback any errors with an expectation that they will be resolved
- **Secondary users of data** (those who may wish to use the data for other purposes e.g. strategy development) – commission the collection and collation of any ‘missing’ data, feedback any concerns with data quality to the data users and use published data for their own internal purposes

The data quality policy will be delivered through:

- **Guidance, support and training:** training on data quality will be offered by the Policy and Performance team, or other providers as necessary, to specific service areas or delivery units, including by attending management meetings to explain data quality requirements, and offering tailored support to individuals or particular teams about best practice and ideal behaviours.
- **Data quality spot-checks for PIs:** the Policy and Performance team will undertake a series of data quality spot-checks on a limited set of performance indicators or data sets each year following a standard methodology.

Where weaknesses are identified, services will be asked to produce targeted action plans to deliver improvement, which will be followed up until completed to ensure improvement takes place. Internal Audit will be able to provide assurance on the application of the overall data quality framework across the Council. Compliance will be monitored and enforced where appropriate by the Policy and Performance team.

- **Communications:** briefing sessions on data quality will be offered by the Policy and Performance team when requested by specific service areas
- **Objective setting:** there is an expectation that officers who work closely with data on a day-to-day basis, or who have a responsibility for overseeing the management of data, will have data quality included in their objectives and/or role profiles in an appropriate and proportionate manner.
- **Reporting:** The quarterly performance management process will be used to verify the data quality associated with our corporate priorities as set out in the Corporate Plan. Data quality issues that are identified will be followed-up with the relevant service(s) and may be investigated in detail through a data quality spot check.
- **Governance:** the Policy and Performance team has responsibility for developing and refining the corporate Data Quality Policy and for providing guidance on its implementation across the Council.

It is the responsibility of each service area/delivery unit to apply the requirements of this policy to their area of work, under the leadership of Heads of Service and service managers. Procedures should be developed in consultation with relevant partners, suppliers, or delivery partners to develop compliance and ownership of data quality.

Internal audit will be able to provide assurance on the application of the overall data quality framework across the Council, and on particular sets of data.

Overview and Scrutiny will have a role holding officers and delivery arms to account, and analysing the data against the agreed outcomes.

Data quality is fundamentally the responsibility of every individual who works with data.

Guidance, support and Training

A range of resources will be developed that will be freely available to all parts of the Council and will allow services to diagnose their data quality challenges and strengths, and put in place targeted actions to deliver improvement where necessary. Data quality training will be included into the induction process for new starters, including temporary staff where appropriate.

Potential risks

Examples of some of the risks associated with data quality problems are: -

- Negative consequences, financial and other, as a result of submitting inaccurate or misleading data in statutory or regulatory returns or in response to FoI requests
- Misleading external and internal impressions of organisational performance.
- Inappropriate decision-making and inefficient service provision.
- Reputational damage in sensitive areas such as adults' or children's' social care.
- Harm to an individual or group of individuals whom the Council has a duty to protect.
- Undermining the Council's relationship with its partner agencies.
- Regulatory action and fines from the Information Commissioner for breaches of the Data Protection Act or FOI legislation.

Annex B – Transparency and Open Data Roadmap

(Please see document attached)

Annex C: Action plan

Link to Corporate Plan	Strategy objective	Project/Action	Outcome	Resources	Timescale	Lead officer	Dependencies
Proud – Our residents will be proud to live in Havering	1: Systems and processes	Make Data Warehouse accessible through a variety of interfaces, creating different 'dashboard' views.	Data Warehouse accessible to variety of audiences	Staff time	September 2017	ICT - Data Warehouse Consultant	Policy and Performance Service
		Procure / develop and embed a corporate performance management tool to improve the efficiency, accuracy and intelligibility of performance data reviewed by senior management and Councillors	Strategic level business intelligence is improved	Staff time Funding to purchase software	System will be procured by November 2016. Embedding the system will depend on a variety of factors and will take place throughout 2017.	C&R Policy & Performance Officer	ICT, Procurement
		Identify services with sufficient data maturity that would be willing and able to develop more focused operational BI dashboards on the Corporate Performance System.	Operational intelligence is drastically improved	Staff time	October 2016	C&R Policy & Performance Officer CHAT Policy & Performance Business Partner	Policy and Performance Service ICT

Link to Corporate Plan	Strategy objective	Project/Action	Outcome	Resources	Timescale	Lead officer	Dependencies
		Procure / develop operational dashboards on the Corporate Performance System where need, readiness and impact justifies doing so	Operational intelligence is drastically improved	Staff time Funding to develop	September 2017	C&R Policy & Performance Officer CHAT Policy & Performance Business Partner to delegate to appropriate team member	Policy and Performance Service ICT
		Once some services have operational BI dashboards on the Corporate Performance System, promote these to other services and complete rollout across the organisation		Staff time Funding to develop	September 2018		Policy and Performance Service ICT
		Investigate options for providing access to national/local statistical datasets. To be investigated as part of the performance management tool.	Access to statistical data	Staff time	December 2016	C&R Policy & Performance Officer & Customer Insight Officer CHAT Policy & Performance Business Partner to delegate to appropriate team member	ICT

Link to Corporate Plan	Strategy objective	Project/Action	Outcome	Resources	Timescale	Lead officer	Dependencies
		Embed use of Mosaic Customer Insight Tool across the organisation through regular demonstrations, use of case studies and regular communication.	Mosaic actively used to support campaigns and projects	Staff time	On-going	Customer Insight Officer Head of Communications	All services
		Review the use and functionality of the Data Intelligence hub.	Decision on the future of the Data Intelligence Hub.	Staff time	March 2017	Customer Insight Officer	ICT
		Make every resident record unique and identifiable through the use of Nomads	Records can be linked via Data Warehouse	Staff time	September 2016	ICT - Data Warehouse Consultant	All services
Proud – Our residents will be proud to live in Havering	2: Policies	Access to corporate and service level policies, procedures and protocols in one place	Policies, procedures and protocols accessible	Staff time	October 2016	Policy and Research Lead, Policy and Performance	Communications

Link to Corporate Plan	Strategy objective	Project/Action	Outcome	Resources	Timescale	Lead officer	Dependencies
		Discuss with strategic partners in health, neighbouring local authorities, other statutory organisations and the third sector, the scope for sharing data where it is appropriate to do so and there are sound business reasons.	Accessible data for public sector use	Staff time	To be explored and initial options assessed by September 2017.	Head of Policy & Performance Customer Insight Officer	None
		Establish an organisational position on transparency and open data and develop a charter that commits us to this position.	Staff have clear leadership on the Council's commitment to transparency and/or open data	Staff time	September 2016	C&R – Policy & Performance Officer	
Proud – Our residents will be proud to live in Havering	3: People	Set clear objectives around business intelligence for staff in PDRs.	Staff have clear objectives around business intelligence and progress is monitored.	Staff time	April 2017 and then on-going	All managers	HR All services
		Provide training to staff on the Data Warehouse	Staff have skills to access and utilise data.	Staff time	On-going	Customer Insight Officer	ICT

Link to Corporate Plan	Strategy objective	Project/Action	Outcome	Resources	Timescale	Lead officer	Dependencies
		Provide training to staff on Mosaic Customer Insight tool	Staff understand value of customer insight and are able to use Mosaic to segment and target customer groups	Staff time	On-going	Customer Insight Officer	All services
		Identify the skills needed to exploit data derived from improved customer and operational insight	Staff have the skills required to generate insight from data	Staff time	October 2016	CHAT Policy & Performance Business Partner and C&R Policy & Performance Business Partner	None
		Complete a skills audit of existing data manipulation and analysis skills across relevant staff	Staff have the skills required to generate insight from data	Staff time	November 2016	C&R Policy & Performance Officer	Staff cooperation
		Create a skills development framework that will structure the development of the requisite skills across the Council	Staff have the skills required to generate insight from data	Staff time	December 2016	CHAT Policy & Performance Business Partner and C&R Policy & Performance Business Partner	HR/OD

Link to Corporate Plan	Strategy objective	Project/Action	Outcome	Resources	Timescale	Lead officer	Dependencies
		<p>Promote and communicate the importance of data quality across the organisation. This is also covered as part of the staff induction.</p> <p>Data Quality training sessions to be held as and when appropriate, dependant on relevant issues. Resources will be developed to assist services in diagnosing their data quality challenges and strengths, and put in place targeted actions to make improvements where necessary.</p>	Staff understand the importance of data quality and embed this in working practices	Staff time	On-going	<p>Head of Policy and Performance</p> <p>Head of Communications</p> <p>CHAT Policy & Performance Business Partner and C&R Policy & Performance Business Partner</p>	<p>Senior management to relay these messages to staff</p> <p>HR/OD</p>
		Deliver data quality training in regards to PIs as part of the development of the Corporate Performance Management tool	Data being input into the new system is of good quality, performance information is reliable and accurate.	Staff time	March 2017	CHAT Policy & Performance Business Partner and C&R Policy & Performance Business Partner	Cooperation of relevant services

Link to Corporate Plan	Strategy objective	Project/Action	Outcome	Resources	Timescale	Lead officer	Dependencies
Proud – Our residents will be proud to live in Havering	4: Culture	Introduce new ‘data broker’ approach to identifying data needs of commissioners	On-going dialogue between Policy and Performance Service and commissioners to capture and respond effectively to data and intelligence needs	Staff time	Iterative. Annually	CHAT Policy & Performance Business Partner and C&R Policy & Performance Business Partner	All services - commissioners
		Capture data needs in service plans	On-going dialogue between corporate team and commissioners to capture and respond effectively to data and intelligence needs	Staff time	Iterative. Annually	CHAT Policy & Performance Business Partner and C&R Policy & Performance Business Partner	All services
		Develop process for capturing and storing data used in commissioning (e.g. Index of Data)	Data and intelligence gathered for commissioning is accessible to others	Staff time	October 2016	CHAT Policy & Performance Business Partner and C&R Policy & Performance Business Partner	All services - commissioners
		Incorporate benchmarking data in corporate performance reports.	Use of benchmarking to demonstrate performance of Council	Staff time	December 2016 (expected go-live date of CPM tool)	CHAT Policy & Performance Business Partner and C&R Policy & Performance Business Partner	All services

Link to Corporate Plan	Strategy objective	Project/Action	Outcome	Resources	Timescale	Lead officer	Dependencies
		Develop communications around business intelligence (including Data Warehouse and Mosaic).	Business intelligence activity effectively communicated	Staff time	September 2016	Head of Communications	Communications
		Develop internal and external communications around transparency and/or open data	Commitment to transparency/open data is effectively communicated to stakeholders	Staff time	October 2016	Head of Communications	Communications
		Develop case studies to demonstrate learning from research/analysis and share this across the organisation to demonstrate the impact of better/improved business intelligence.	Learning shared from research/analysis and used to plan services, inform resource allocation and improve efficiency and outcomes	Staff time	On-going	Customer Insight Officer C&R – Policy & Performance Officer CHAT Policy & Performance Business Partner to delegate to appropriate team member	None

Annex D: Glossary of terms

Analytics: the systematic computational analysis of data or statistics.

Business intelligence: a set of techniques and tools for transforming raw data – often stored in a format that is not optimised for analysis – into meaningful and useful information. Business intelligence simplifies information discovery and analysis, making it possible for decision-makers at all levels of an organization to more easily access, understand, analyse, collaborate, and act on information, anytime and anywhere.

Confidence intervals: a measure of confidence presented alongside statistics that are calculated from samples. Statistics calculated from samples are only an estimate of the value that exists within the entire population. We therefore present the statistics alongside confidence intervals to indicate the range within which we can predict the true value of the whole population will fall.

Corporate Performance Management: corporate performance management is the area of business intelligence involved with monitoring and managing an organization's performance, according to key performance indicators (KPIs) such as revenue, return on investment, overhead, and operational costs.

Dashboard: an easy to read page or several pages of information on a specific business area. Dashboards built using modern business intelligence tools can present data dynamically, shifting what is displayed in response to selections made by the end user. These dashboards are typically displayed through web browsers, meaning they are available to multiple users across an organisation.

Data: facts and statistics collected together for reference or analysis. See *qualitative data* and *quantitative data* definitions for more detail

Data Warehouse: a large store of data accumulated from a wide range of sources within a company and used to guide management decisions. Often data warehouses contain data that has been structured to make analysis of that data as efficient as possible.

Demand Management: a planning methodology used to forecast [predict], plan for and manage the demand for products and services. This can be at macro levels as in economics and at micro levels within individual organizations.

Descriptive statistics/analytics: used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. Together with simple graphics analysis (eg line graph or pie chart), they form the basis of virtually every quantitative analysis of data. Examples include cross-tabulations, averages, percentages, ratios, standard errors, and many more.

Granular(ity): the level of detail that data is available at. For example, a statistic about parking income for the year is calculated using data which provides information on every parking ticket. If we were to present the transactional level data, we would say we are showing data at the most granular level.

Interface: an automatic connection with a computer or ICT system. In the context of this paper, interface is used to refer to the interface between data sources and a data visualisation tool.

Management methodology: a system of methods used for management of an organisation. The Balanced Scorecard and Six Sigma approaches are two examples of management methodology.

Metrics: a standard of measurement.

Open data: data that is machine readable and in non-proprietary format. For example, a CSV file, which can be read and presented by a number of different software packages such as Microsoft Excel and Google Docs. This format of document makes the data available to a larger user base and aids the linking of data to create new knowledge.

Open licence: A licence used in conjunction with the Reuse of Public Sector Information Regulations 2015, which gives end users the right to reuse certain information for a number of purposes including commercial activity. It contains within it, a list of exemptions that prohibit the use of images and logos among other things.

Segmentation: the process of subdividing the population into homogenous groups with shared needs and characteristics based on who they are, what they do and how they think and feel.

Predictive analytics/modelling/statistics: the branch of the advanced analytics which is used to make predictions about unknown future events. Predictive analytics uses many techniques from data mining, statistics, modeling, machine learning, and artificial intelligence to analyze current data to make predictions about future.

Qualitative data: Non-numeric data concerned with understanding perception and perspective. For example, an interview transcript provides qualitative data that can be analysed in great detail to generate a deeper understanding of an individual's experience.

Quantitative data: Numerical data that can be quantified and used for statistical analyses to identify trends in social phenomena.

Segmentation: The process of subdividing the population into homogenous groups with shared needs and characteristics based on who they are, what they do and how they think and feel.

Significance testing: When differences are observed between two or more groups, we use significance testing to determine if the observed difference is the result of chance or an actual difference. The use of significance testing allows us to be clear about the extent to which a result deviates from that expected to arise simply from random variation or errors in sampling

Statistical Process Control: is a method of quality control which uses statistical methods. SPC is applied in order to monitor and control a process. Monitoring and controlling the process ensures that it operates at its full potential.

Time series: a series of values of a quantity obtained at successive times, often with equal intervals between them. Time series analysis are used to identify how particular patterns change over time.