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INTELLIGENCE LED POLICING AT THE AMSTERDAM-AMSTELLAND POLICE DEPARTMENT: OPERATIONALISED BUSINESS INTELLIGENCE WITH AN ENTERPRISE AMBITION

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ABSTRACT

This article elaborates on the setup for Intelligence Led Policing (ILP) in support of ensuring public safety as it presented itself in the Spring of 2007 at the Amsterdam-Amstelland Police Department in the Netherlands. The picture that is painted is the outcome of a qualitative research effort involving semi-structured interviews triangulated with other internal data sources. The main goal of the article is to establish how an organisation can leverage its operationalised business intelligence ambition by connecting it into an ambition for better enterprise management. The case ends in showcasing two popular operational business intelligence tools instrumental to capacity management.

Keywords: business intelligence; BI; operationalising BI; intelligence led policing; ILP; enterprise management

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1 INTRODUCTION

Extracting “intelligence” for decision making from raw data stored in relational databases, multidimensional databases, and relational online analytical processing servers is a complex chain of tasks, and requires adequate information technologies (IT) (Weir, 2000; Cody et al., 2002). Nowadays, the latter are associated with the label “business intelligence” (BI).

Roughly, BI technologies have evolved through three generations (Watson et al., 2006). In the early 1970s decision support systems were application centric. Data was used to support only a single or perhaps a few related applications. The second generation of technologies, the data warehouses, appeared around the 1980s. These were more data centric, and could feed various applications. Around the turn of the century, a third generation of BI technologies emerged. These were no longer limited to understanding past events. While much of the backbone technologies, e.g. the data warehouse remained equally important, new analytical BI technologies were designed to anticipate what was likely to happen in the future.

Although these technological capabilities have now been around for some time, finding the most suited ways to leverage them for business success remains an issue for a significant number of organisations. Especially today, when the challenges associated with the rapidly changing nature of the globalised economy are becoming palpable for more and more organisations, and the promises of right-time data are being welcomed as the foundation for the required decision making agility (Li, 1999).

A widely spread observation nowadays is that the application of BI technologies has all too often been confined to support a limited crowd of back-office analysts or a very small fraction of top-level decision makers. The notion of “operationalising BI” tries to break away from this narrow view on the business potential of BI technologies. It embodies an organisation’s ambition and ability to provide as much as possible of its constituents, not least the mass of operational decision makers, with accurate information at the right level of detail, and at the right time and place. It is the evolutionary step to get BI out to the masses and make it pervasive throughout the organisation.

The setup of an operational BI competency can certainly prosper from being rightly framed within an "enterprise management" understanding of executing an enterprise strategy. Methodologies such as the "Balanced Scorecard,have emphasised the importance, ideas and principles of enterprise strategy execution. Most of them stress the following management features: (1) the use of metrics to guide decision making; (2) the use of a balanced set of metrics, i.e. reflecting the extensive span of business objectives; (3) the right time delivery of actionable management information; (4) horizontally integrated enterprise management, i.e. cutting across functional and other organisational silos; (5) vertically integrated enterprise management, i.e. linking strategy formulation to the operational execution; and (6) closed loop management, i.e. emphasising continuous improvement and double loop learning (Viaene and Willems, 2007).

The enterprise management way of operationalising BI is certain to engage an organisation in an arduous journey. It will not be easy to get to a point where the use of BI inextricably connects to the daily activities of decision makers within and across all levels of the organisation (Carte et al., 2005; Eckerson, 2007; Watson and Wixom, 2007). It definitely involves more than developing cutting-edge analytical and data infrastructure. The potential benefits of succeeding in this effort are high though. Analytical competition has arrived (Chan, 2006; Davenport, 2006). Already several organisations are successfully leveraging their analytical capabilities as a distinctive source of competitive advantage.

By positioning their operationalised BI ambitions as a key element in realising better enterprise management, we believe that organisations can escape from ending up with a cluttered operational BI setting of functionally disconnected and locally idiosyncratic information products. To illustrate this claim, this article presents a synthesis of a case study involving the Amsterdam-Amstelland Police Department (AAPD), and their set up for Intelligence Led Policing (ILP). It describes their operationalised BI setting as it presented itself in the spring of 2007. The data for this case study came from a series of semi-structured interviews at all levels in the organisation. The results from these interviews were triangulated with data from observations, internal reports and the intranet of the AAPD (Yin, 1994). The presented material reflects what emerged as the technological and organisational keystones of the AAPD's ILP capabilities.

The article aims to contribute to the existing literature in the following ways. First, we encountered some first person accounts and position articles on topics related to operationalised BI in non-specialist literature (Violino, 2004; McAdams, 2006; Gonsalves, 2007). However, little academic research has been published that provides insight into the full breadth of an operationalised BI setting (Anderson-Lehman et al., 2004; Watson et al., 2006; Wixom et al., 2008). Second, while ILP has been around for about 15 years, again apart from a couple of noted contributions (Collier et al., 2004; McGarrell et al., 2007) academic research on ILP remains extremely scarce. This article aims to contribute specifically to building the body of knowledge on how ILP is enacted in a real-life setting.

The article is structured as follows. The first section elaborates on the ILP philosophy and its instantiation into four guiding principles for an ILP decision making process. The next three sections of the article deal with the case study at the AAPD. After a short introduction to the AAPD, we discuss the enterprise data warehouse, the role of a central management information department and the operational decision making structure at the AAPD. The discussion on the operationalisation of BI at the AAPD culminates in the presentation of two operationalised intelligence tools that feed into the decision making processes of the AAPD for capacity management. We close the article with a conclusion.

2 INTELLIGENCE LED POLICING

Policing is a knowledge intensive affair. Over the past fifteen years or so, voices have risen to make a shift from a more traditional reactive, intuition led style of policing to a more proactive, intelligence led approach (Collier, 2006).[1] ILP promotes this use of factual, evidence based information and analyses to provide management direction and to guide police actions at all levels of a police organisation. The goal is to complement intuition led police actions with information coming from analyses on aggregated operational data, such as crime figures and criminal characteristics (Collier et al., 2004).

ILP not least introduced the value of supporting police decision making with better information at all levels in the organisation. It serves as a backdrop for developing the needed integration of technologies and processes to collect, to analyse, and to provide relevant information for police officers in their efforts to reduce crime. It also provides the perfect springboard for an enterprise approach to operationalised BI.

The ILP philosophy does not elaborate on the practical roll-out of such a setting. Therefore the AAPD based itself on a more developed framework to steer their efforts, i.e. CompStat. The latter originated at the New York Police Department in 1994 (Weisburd et al., 2004). It is a goal oriented, strategic management process that uses IT, operational strategy, and managerial accountability to guide police operations (Walsh and Vito, 2004). It serves to instantiate ILP in American policing, acting as an example for many other police departments all over the world.

Four guiding principles summarise the cornerstones of CompStat (Walsh and Vito, 2004; McDonald, 2004; Willis et al., 2007):

(1) Information availability: Accurate and timely information is to be made available at all levels in the organisation.
(2) Actionable information: The most effective tactics are to be determined from the available information products to tackle specific problems. This is what Collier (2006) denominates as actionable intelligence.
(3) Swiftness of reaction: A sense of urgency is especially important in the context of policing. Therefore, a rapid and focused deployment of the available capacity is to be implemented.
(4) Feedback and learning: A relentless follow-up and assessment is to make the first three principles ever more effective and aid towards better enterprise management.

Although these principles have clear technological consequences, their main goal is organisational. They aim to guide police organisations in their efforts to become a more responsive system to management direction; more specifically, in the context of ILP, management direction based on information coming from and enacted by different levels of the policing organisation.

3 THE AAPD CASE STUDY

The Amsterdam-Amstelland Police Department (AAPD) comprises the municipalities of Aalsmeer, Amsterdam, Amstelveen, Diemen, Uithoorn and Ouder-Amstel in The Netherlands. This region covers 357 square kilometres and has a population of 900,000 citizens. It is organised in five districts and has in total 32 neighbourhood police teams that all together serve 211 neighbourhoods. The AAPD has 5,800 officers and an annual budget of 394 million Euros.[2]

The two core processes of the AAPD are (1) ensuring public safety and (2) criminal investigations. The former focuses on the daily policing tasks, i.e. keeping public order and protecting lives and property. The latter involves detectives solving a reported crime fact. The AAPD is organised around these core processes with a limited overlap between both. This article results from the research that was conducted around the enterprise information management processes related to ensuring public safety.

In 1993, the annual crime report issued by the AAPD alerted for a record increase in crime. This triggered the AAPD to set up actions to find new ways of fighting crime. Between 1993 and 2004, the AAPD developed quite some new tools, and spread special crime analyses in the organisation. However, they did not feel this approach was fully accomplishing their intentions. This was confirmed in **a**n audit report that appeared shortly after the appointment of a new Chief of Police in November 2004. It suggested the ILP philosophy to transform the AAPD into an efficient and effective police department (Welten, 2004).

The AAPD consequently formulated definitions for effective and efficient policing. Effective policing implied policing that focused on increasing the public safety by anticipating crime and providing information to all decision makers. Efficient policing alluded to professionalising the activities by creating a smooth flow of information, exchange of experiences and availability of information products (i.e. tools or reports). This set off the path to operationalised BI specifically tuned to support police decision making at all levels in the organisation.

3.1 The Data Warehouse: Enterprise Platform for Execution

The original data warehouse had an anatomy that would not be able to support the tools required for ILP. There were issues with integration, data quality, metadata, performance, level of detail, and security. The AAPD understood that they needed a more advanced and integrated enterprise data warehouse capability to have the right intelligence for, not least, supporting operational decision making.

The new data warehouse had to enable the AAPD to operationalise BI and work on connecting all partners in the "chain of contacts." This chain of contacts referred to the set of interactions of a (potential) suspect with, for example, police officers, the court of justice, and the prison system. At the outset, each of these partners had its own databases documenting events. These data sources were not systematically linked into the original data household of the AAPD.

The project to start building the new enterprise data warehouse was labelled the "Scoundrel in Chain(s)" (SiC) project. The SiC project initiation document identified the following eight requirements to the development team:

(1) flexible (i.e. extendible and adjustable);
(2) controllable and maintainable (both technically and functionally);
(3) looking at the chain of contacts end-to-end;
(4) compliant with the privacy legislation (e.g. giving rise to role based security requirements);
(5) univocal (i.e. implying the use of a metadata management system, enabling a "single version of the truth");
(6) consistent linking of data and high quality data input;
(7) meeting performance requirements (i.e. seeing to right-time extracting and loading of data);
(8) ensuring a fit with yet to-be-integrated data households (i.e. well architected).

Several sources, some located at the partners in the chain of contacts, ended up feeding the enterprise data warehouse, out of which information was extracted into a set of data marts serving several subject areas. With the new data warehouse architecture enabling a sufficient linkage between source systems and data marts, the AAPD rapidly advanced towards the deployment of right-time information products. Noteworthy was that by applying a "not too little, though just enough" data warehousing and architecture approach, that was intended to mature over time, endless debates on "building the ultimate data household first before executing on it" were cut short. This pragmatism allowed the AAPD to move rapidly from the "build" phase to the "run" phase, supporting actual decision making.

3.2 Management Information and Research

A pivotal player in the organisational constellation set up to operationalise BI was the Management Information and Research (MIR) unit. Its mission statement read as follows: "The MIR supports developing, generating and evaluating management policies by providing management information and research results."

The MIR was one of the subunits of the Organisation Information Department (OID). In turn, OID was one of the nine supporting departments at the AAPD. The MIR functioned as the centralised authority overseeing management information support and assumed many of the responsibilities of what Gartner[3] called a BI Competency Centre (BICC). Dresner et al. (2002) defined a BICC as a cross-functional team with specific tasks, roles, responsibilities and processes for supporting and promoting the effectiveness of BI.

The MIR essentially took up five roles. First, it took care of all BI related education and training. Second, it performed tasks that resorted under enterprise project management. This included taking care of the process for intake and prioritisation of BI projects, and setting up for user supported requirements analysis, prototyping and pilot testing. The MIR would also take care of the actual development, roll-out and subsequent support of information products, often by bringing in externally sourced help. Promoting the consistent use of these information products throughout the organisation was an important objective. Third, the MIR acted as a data steward at the disposal of information users. Important issues were the management of the metadata and the quality of the data input. That, without any doubt, was what remained one of the most challenging duties.

Fourth, the MIR would also remain available to answer very specific ad hoc information requests, for example requiring the application of advanced analytical techniques. Fifth, the MIR oversaw the enterprise data warehousing architecture, linking different sources into data marts connected to engines for analytics and reporting.

This competency centre served to allow the whole of the AAPD to steer the organisation's capacity towards crime reduction priorities. The MIR was positioned as a catalyst, stimulating the engagement of the AAPD in ILP and the operationalised BI endeavour, allowing the AAPD to anticipate crime based on data analysis and to complement the intuition of police officers with intelligence for their day-to-day operational activities.

3.3 The AAPD's Operational Decision Structure for Ensuring Public Safety

Within the AAPD, police decision making happened at three levels. This is not much different from how a typical police organisation would be operated. The three levels were:

- the Corps Management Team (CMT);
- the District Management Team (DMT);
- the Neighbourhood Police Team (NPT).

The CMT consisted of the police executives that determined the priorities for the full constabulary. CMT members translated the strategy in clear objectives that linked to a balanced set of performance metrics for the entire police force. The DMTs in turn defined the objectives and performance metrics for their district. A DMT would derive these objectives from the priorities worked out by the CMT. Aligned with the performance metrics and the actionable management information, a DMT would allocate available capacity, for example police officers, to a specific neighbourhood. The NPTs formulated their operational priorities, based on decisions made and communicated by their DMT. Each NPT then managed the capacity accordingly.

Each level of decision making at the AAPD had a specific informational need. For example, information used by the police executives in the CMT meetings covered the complete region and was much more general (e.g. crime trends) while information made available to a NPT focused on the neighbourhood and was much more detailed (e.g. burglary in a specific beat).

Figures 1 and 2 illustrate how, in order to prevent having a disjoint three-layered organisation structure, the AAPD installed steering committees linking the different decision making levels. Their aim was to enable horizontally as well as vertically integrated enterprise management based on information support from the MIR. For example, these steering committees consolidated feedback on the priorities and suggested actions.

Insert Figure 1 & 2 About Here

The information brokers in Figures 1 and 2 had a role that is similar to the roles of "business analyst" or "business architect" in many organisations. They essentially liaised, orchestrated and facilitated the communication between different stakeholders. They helped translate and communicate the decisions and strategy towards the lower level. Information brokers also helped consolidate the feedback from the lower level, and fed this back upwards. Furthermore, information brokers were responsible for relaying important semistructured and unstructured information into the MIR that, with their help, would try to flesh it out and then help colleagues interpret and work with the historical and anticipated crime facts that would be returned.

3.4 Operationalised BI Exemplified

Police decision makers in the entire organisation confirmed that capacity management was one of their most important responsibilities. Having actionable intelligence at their fingertips was considered a necessary condition to allow for a rapid and focused deployment of the available capacity. More specifically, among the tools that were developed at the AAPD to cater to this need, two complementary ones stood out: Early Warning and Data Detective. The former functions as an early warning monitor, whereas the latter adds the typical next-step capability for visually enriched data navigation and analysis, giving rise to operationally actionable crime reporting.

3.4.1 Anticipate and Monitor with Early Warning

Inspired by the American CompStat example, intelligence led anticipation and close tracking of crime has become one of the fundamental pillars of policing in the Amsterdam-Amstelland region. Intranet based performance dashboarding labelled as Early Warning has proven instrumental to this end.

On top of the enterprise data warehouse the AAPD installed an automated information processing capability that made use of the most recent as well as historical data to give rise to Early Warning dashboards for tracking and anticipating crime. The MIR had developed and was in charge of maintaining the dashboards in close cooperation with the end users. It took care of automating the information feed into the electronic dashboards that were pushed via the intranet to the different decision makers in the organisation; from the police executives to the neighbourhood police officers; from the corps information broker, over the district information brokers, to the neighbourhood information brokers. Early Warning was widely recognised to perform relatively well in anticipating crime and, consequently, in the intelligence led upgraded capacity management.

Figure 3 shows one of the underlying components of Early Warning. The figure depicts a series of historical (including the most actual) crime data and the anticipated number of crime reports, in this case for burglary, for the next weeks. The anticipated number was based on historical data, corrected for seasonality effects, new trends, etc. This Early Warning functionality was made available to users with an anticipation horizon of maximally six months. Based on among other things this output, proactive tactics were developed and deployed to reduce crime.

Insert Figure 3 About Here

A standard Early Warning dashboard comparing actual number of crime reports with predefined targets is depicted in Figure 4. This report would attend police officers involved in capacity management to criminal offences prioritised by the CMT, focusing the constabulary on a limited list of offences, regularly decided upon. This weekly updated monitor signalled remarkable deviations from a periodic average. It used a colour scheme with "red lights" (i.e. "warning, the annual target might not be met, all other things being equal"), and "bright lights" (i.e. "better than expected"). Again, the MIR not only made this information available to the constabulary via the intranet, it also promoted the effective use with training and education.

Insert Figure 4 About Here

Depending on a user's role in the organisation, the information provided in the dashboards would vary in focus and in detail. A report to CMT would contain more aggregated information than fine grained operational information, though there was a possibility to drill down into the details. A NPT would be more interested in receiving information and analyses for specific beats.

3.4.2 Analyse with Data Detective

Data Detective complemented the Early Warning dashboards with the potential for follow-through data navigation and analysis. The tool itself was operated by a limited number of expert analysts within the MIR. However, the carefully designed reports synthesising these analyses for decision makers were widely used. Frequently requested and used information products coming out of Data Detective were as much as possible pushed into the organisation using regularly updated standardised electronic reports, again using role based views. Often, specific requests for more in-depth information popped up during steering committee meetings. These would then be passed on to the MIR via an information broker. Within MIR, a dedicated team of expert analysts would take the requests to heart and aim for a consolidation of actionable information that would be swiftly pushed back to the requesting party in a usable format, using the intranet.

One of the most popular information products used by steering committees coming out of Data Detective was an extensive weekly report, consolidating many frequently asked questions on the what, the where, the when and the who involved in crimes. Anew, the source data integration at the data warehouse proved to be extremely valuable on many occasions. For example, a crime perpetrator who had been in jail for the last month could not possibly be a potential suspect of a crime committed just a week ago. In order to establish this, the MIR had to manage the integration of prison system data with the AAPD's data warehouse.

Under the motto "a picture tells a thousand words," here are some examples of popular items contained in the weekly report:

(1) A first item, depicted in Figure 5, visualised crime facts on a map of the Amsterdam-Amstelland region by means of "hot-spot crime clouds." The darker a region, the more crime facts were reported. The map included in the report was subdivided in the specific beats and allowed for comparing and analysing previous periods to spot shifts in locations.

Insert Figure 5 About Here

(2) A second item, depicted in Figure 6, reported on "clustered crime clouds" based on a combination of time and location information, mapped for the Amsterdam-Amstelland region.

Insert Figure 6 About Here

(3) A third item presented an overview of the top crime perpetrators with the possibility to seamlessly zoom in to their "index cards," as depicted in Figure 7. The latter were specifically aimed at supporting police officers on the beat to focus their attention and to recognise or keep an eye out for these people.

Insert Figure 7 About Here

5 CONCLUSION

The main goal of this article has been to establish, by means of elaborating on a researched case study, how an organisation can benefit from framing its operationalised BI ambition as part of, arguably the most important part of, developing better enterprise management. This, in contrast to the pursuit of merely locally optimised BI tooling efforts. In 2004, with the adoption of the ILP philosophy and the derived aims of efficient and effective policing, a new Chief of Police has effectively set the AAPD out to accomplish just that.

The pursuit of an operationalised BI objective with a better enterprise management ambition, firmly anchored the required information technologies (more specifically, the enterprise data warehousing and other BI technologies) and their organisational complements (more specifically, the MIR, the information brokers, and the steering committees between the management levels) to the enterprise as a whole. This has given rise to an environment where police officers at the different decision making levels of the AAPD made use of fact based, integrated and aligned intelligence as a complement to their intuition.

Alongside our ambition embodied by this article to showcase two popular operational BI tools instrumental to capacity management at the AAPD, the article also constitutes an effort to make the reader feel how each of the components discussed as part of the operationalised BI constellation at the AAPD reinforced the others in making the BI setting both operationally effective and enterprise wide. It allowed us to illustrate the size and complexity of the effort.

The MIR, a centralised authority overseeing management information support has proven to be pivotal to the success. It constituted the nexus around which the steering committees and information brokers captured and redistributed aligned and actionable intelligence to the police offers at the different decision making levels of the AAPD. During our interview sessions people at the MIR regularly emphasised the difficulty of striking many a delicate balance in their interaction with decision makers over their requests for information. One of the most noteworthy ones was the balance between imposing governance (serving enterprise integration) and executing pragmatically (serving local or personal aspirations) in support of the AAPD's operationalised BI ambitions. Still, they seemed to be managing quite well.

Our contention that many current views on operationalising BI have the enterprise as a blind spot, leaves these organisations at risk of incrementally developing a convoluted operational BI environment. We believe it therefore necessary for current theories and definitions positioning operationalising BI to take up a reference to better enterprise management. We firmly believe that future research into designing the practices and digging up the success factors underlying this kind of operationalised BI capability will prove useful in supporting a manifold of contemporary organisations. What is more, we believe that given the pivotal role we have seen the MIR play at the AAPD, in-depth investigation into the what and the how of BICCs as a catalyst for executing on that promise will prove instrumental.

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Notes

[1] For more information on the origins of ILP, see e.g. McGarrel et al. (2007).
[2] For more information on the AAPD please, visit their website, i.e. http://www.politie-amsterdam-amstelland.nl.
[3] For more information on Gartner, please visit their website, i.e. http://www.gartner.com.

Figure 1: Illustrating the steering committee linking CMT and DMT

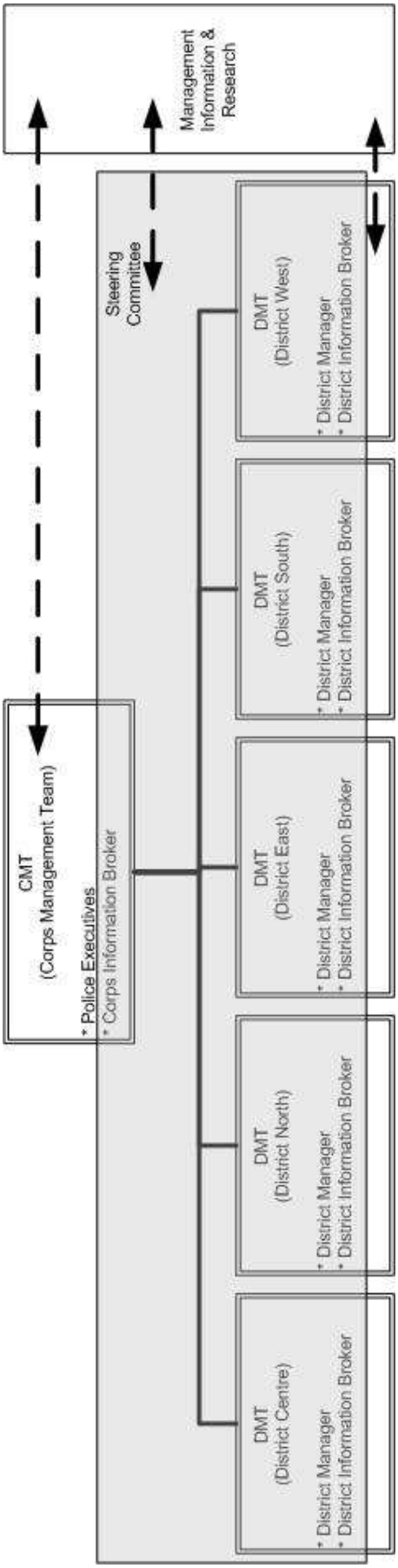

Figure 2: Illustrating the steering committee linking DMT and NPT for the Northern District

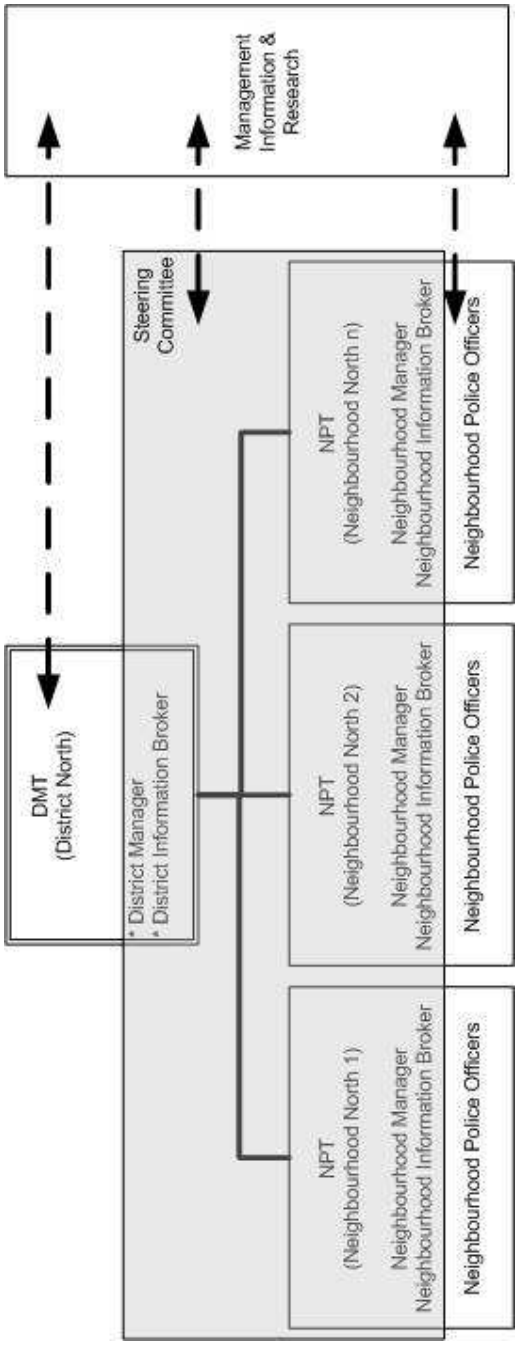

Figure 3: Anticipated and actual burglary in the Amsterdam-Amstelland region (example taken from burglary statistics)

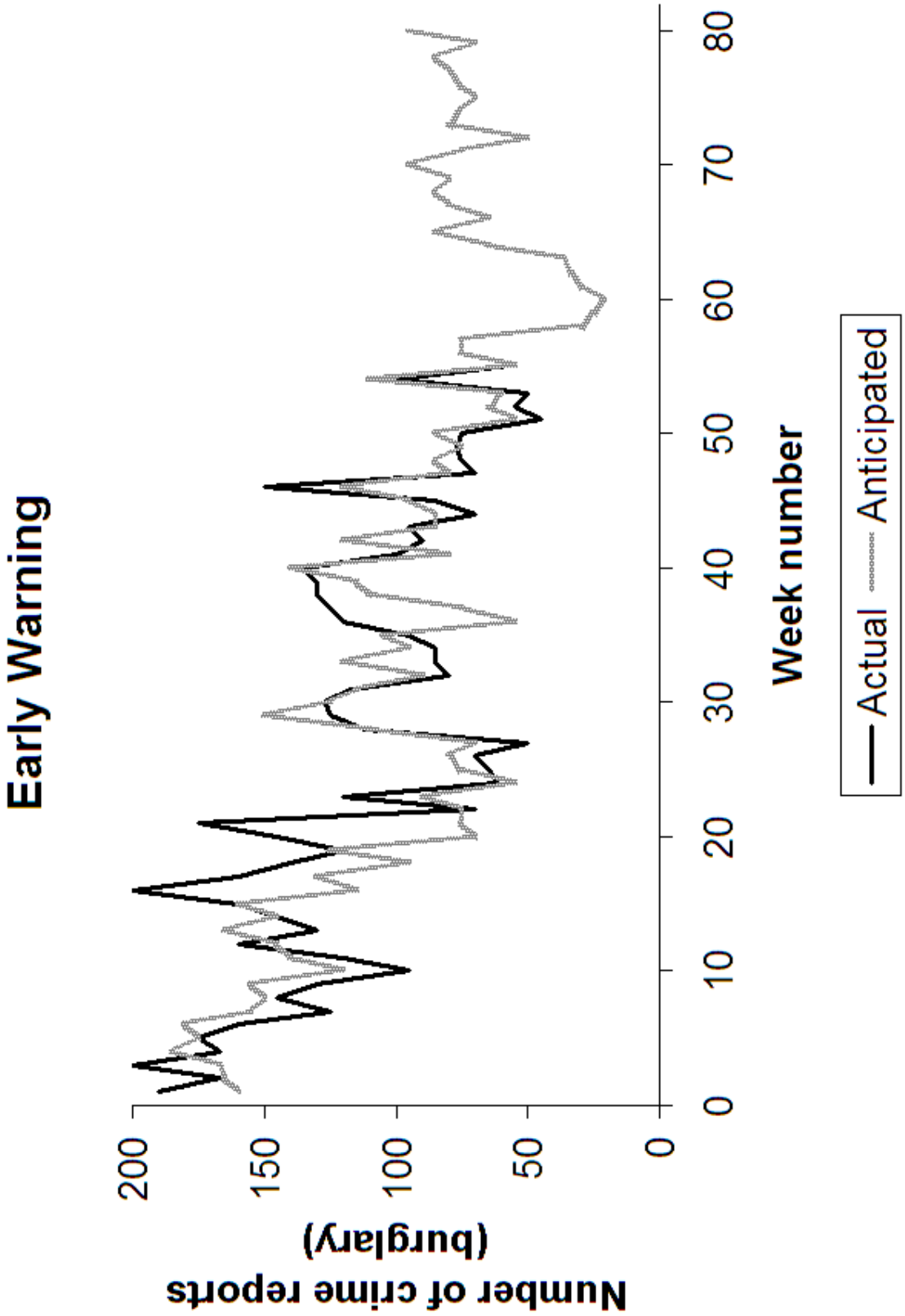

Figure 4: Early Warning reporting on a selection of crime facts

Amsterdam-Amstelland Police Department

Period: October 2005

	Actual Period	Actual Cumulative	Average Period (linear)	Average (season)
Criminal offences (priorities set by CMT)				
Total crime reports	518	4622	431.49	465.75
Burglary (home)	19	372	30.84	36.43
Burglary (cars)	178	1094	90.77	96.59
Pickpocketing	24	206	18.94	20.51
Violence against the person	11	114	9.79	10.78
Robbery	3	43	2.86	3.57
Early Warning offences				
Total crime reports	518	4622	431.49	465.75
Burglary (garage, lean-to, garden house)	25	205	13.45	14.01
Burglary (cars)	178	1094	90.77	96.59
Sexual offences	4	30	2.09	2.35
Bright light offences				
Burglary (home)	19	372	30.84	36.43
Burglary (bike, motorbike)	26	318	37.43	42.35

Color	Description
	Bright light
	Warning!

Report by: Management Information & Research

Figure 5: Example of a hot spot analysis for a larger region (actual figure is in colour)

Figure 6: Example of a hot spot clustering analysis - zoomed in on three smaller beats (actual figure is in colour)

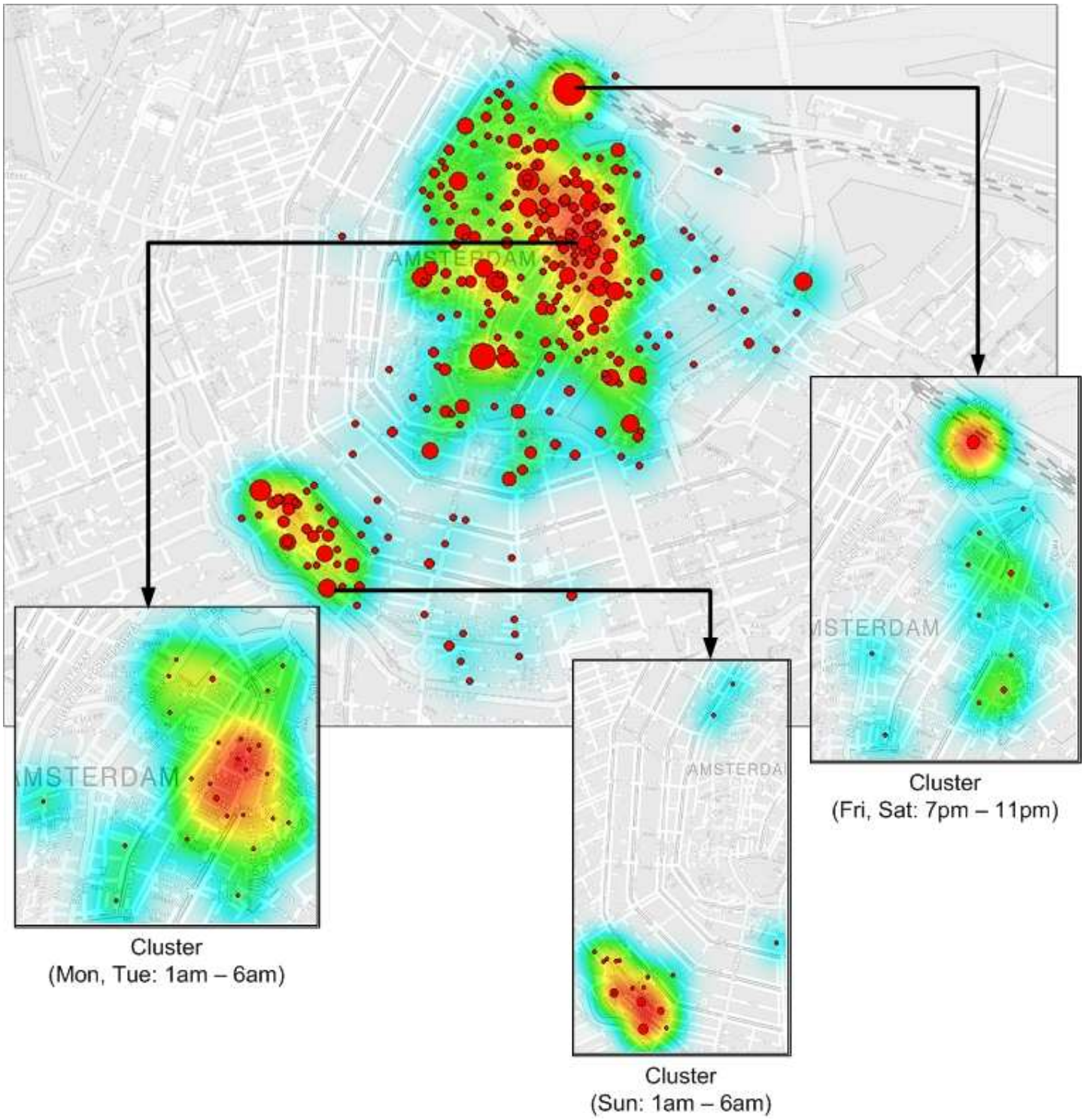

Figure 7: Example showing index card of crime perpetrator in Data Detective report (actual figure is in colour)