Visualisation of crime in shopping centres

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‘Going shopping’ is perceived to be an activity filled with great pleasure (Bamfield, 2012)

Sweden has about 300 shopping centres today, double as much as the country had ten years ago (Sörbring, 2012)
More than shopping: Shopping centers as places of entertainment

Shopping centers have evolved from a group of stores to large enclosed malls with an eclectic number of services and functions, including sports, culture and entertainment.
More than shopping: Shopping centres as criminogenic places

• Shopping centers are regarded as safe places (Salcedo, 2003)

• But they are also targeted by crime (Savard & Kennedy, 2014), place of ‘convergence’ - time-space variations

• The challenge for shopping malls is to create an environment that is at the same time entertaining and safe (Kajalo & Lindblom, 2016)

prevent crime – against visitors (Farrag et al.,2010)
against themselves (Perlman & Ozinci, 2013)
Aim & objectives

Aim

to understand the nature of crime in space and time in a shopping centre using three-dimensional visualization techniques

Objectives

1. to create a BIM model that allows crime mapping and three-D visualisation

2. to detect areas that run higher risk of crime (types of crime/time) using BIM

3. to assess places in the shopping centre that are in most need of intervention through fieldwork inspection and CPTED principles
Previous work

1) Rengert et al. (2000) +

CAD + GIS Data surveys

2) "The law of crime concentration", Weisburd (2015)

3) Situational crime prevention, Clarke (1995)
The conceptual model

Spaces that are *criminologically relevant* to perceived safety in shopping centres

Ceccato (2015)
The conceptual model

Spaces that are *criminologically relevant* to & perceived safety in shopping centres

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**Functional spaces** (store, restaurant/cafe, library, cinema)

**Public spaces** (large corridors, food court, toilet, garage)

**Transitional areas** (escalators, stairs, tunnels, elevator)

**Entrances/exits** (doors, e.g. traditional, revolving, sliding)

**Immediate surroundings** (square, parking lot, mixed land use)

Ceccato (2015)
The conceptual model

Spaces that are *criminologically relevant* to & perceived safety in shopping centres

**Scale of analysis**

- **Macro**
- **Meso**
- **Micro**

**Ceccato (2015)**

<table>
<thead>
<tr>
<th>Category</th>
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The conceptual model

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The conceptual model

Spaces that are *criminologically relevant* to crime & perceived safety in shopping centres

1. **Functional spaces**
   - A store

2. **Public spaces**
   - Food court

3. **Transitional areas**
   - Stairs

4. **Entrances/exists**
   - Revolving exits

5. **Immediate surroundings**
   - Transportation hub
Method & data

Our approach:

Visualisation of crime records on BIM – Building Information Modelling
&
Crime Prevention Through Environmental Design

Data: 17 months of records (2014-2015) from security company in the Shopping center, in a total of 5780 records

Tools: Revit 2013, Solibri v. 9.6, in-House tool Crime2IFC

- fieldwork inspection → suggestion for improvements
MACRO-SCALE
The shopping center
MESO-SCALE
The retail floor
MICRO-SCALE
Individual stores
Records security company
PDF-XML

XML files & data pre-selection

Filter crime Codes-keywords

Matching crime to location-model

Populating the open-format BIM

Drawing the object-oriented model

Building in pdf format

Visualisation

Time
Space
Fieldwok

Suggestions for crime prevention

Fieldwok
Figure Simplified schema of Crime2IFC
What, when and where?
Which are the most common events?

Public disturbance & vandalism 68%
Violence & threats 17%
Theft, robbery & shoplifting 16%

Jan 2014 - May 2015
N=5768 events
11,2 cases per day
about 1 event per open hour
When do most events happen?

![Graph showing the frequency of events by time of day]

- **23:00-24:00**: 20%
- **22:00-23:00**: 15%
- **21:00-22:00**: 10%
- **20:00-21:00**: 5%
- **19:00-20:00**: 0%

*Public disturbance & Vandalism*
When do most events happen?

- Public disturbance & Vandalism:
  - 23:00-24:00
- Thefts & Robbery:
  - 21:00-22:00
  - 22:00-23:00

When do most events happen?

- **Thefts & Robbery**
- **Public disturbance & Vandalism**
- **Violence & threats**
Average 358,000 visitors a week (trading hours, 2014)

Weekdays-Weekend variations

Days of the week

Events/10,000 visitors
Crime prevention requires crime profiles in time & space

- By crime type
Crime specialisation

• By time
Violence & threats
Public disturbance & vandalism
Thefts, robbery & shoplifting

Off-peak hours 10:00 – 12:00
Violence & threats
Public disturbance & vandalism
Thefts, robbery & shoplifting

Peak hours 18:00 – 20:00
Conclusions and looking ahead

RESEARCH

• Distinct space-time patterns of crime at micro-meso scales

• Beyond the prototype: A 3-D visualisation tool on daily basis in shopping centers

• Modelling shopping center environment & crimes

• Crime & fear in shopping centers
Conclusions and looking ahead

There are 3 types of places most in need:

- Public spaces
- Entrances
- Functional spaces

IMPLICATIONS TO PRACTICE

Business specific!

- The food court
- Entrance(s)
- Particular premises
The food court

More than formal social control, security of the food court can be improved by dealing with issues of design — permeability and territoriality.
Stores

Crime prevention measures have to be business specific!
Safety problems require a **multi-pronged approach**, in collaborative schemes!
Thank you!
The importance of neighbourhood context in understanding the risk from shop theft

Dr. James Hunter and Dr. Laura Garius, Quantitative & Spatial Criminology Research Group, Nottingham Trent University
Overview of research project

- Poor knowledge of true scale of shop theft in core cities
- Poor understanding of motivation, mode of operation and background of offenders
- Effectiveness of security measures
- New estimates of shop theft at the neighbourhood level
- Interviews with prolific shop theft offenders in Nottingham
- Analysis of offender neighbourhoods of origin and distance to travel.

Risk of shop theft by retail sector at neighbourhood level
Are shop theft offenders *over-represented* in certain neighbourhoods?

What type of neighbourhoods are these?

How can this help retailers understand the shop theft risk threat they face?

Core City A in England, 2003-2014 – 95,700 police recorded offences where crime and offender home postcodes are known
Why does neighbourhood matter? Place poverty and neighbourhood effects

“People poverty occurs where low-income people occupy certain parts of a city by virtue of their low income – but their money incomes are not low because of where they live” (Smith, 1977).

“Place Poverty: People are poor because where they live compounds the advantages or disadvantages of particular groups by virtue of where they live” (Smith, 1977)

NEIGHBOURHOOD EFFECTS:
• Function of, and relationship between, neighbourhoods;
• Spill over effects;
• Physical infrastructure, built environment and use of public spaces;
• Social networks, social capital and well-being;
• Access to, and use of, political networks;
• Quality of public services, partnership and strategic leadership;
• Identity, ownership and attachment.

(Hunter, 2011)
Crime hotspots and offender neighbourhoods

Park, Burgess & McKenzie (1925) – zones of ‘transition’ and ‘stability’

Shaw and McKay (1942) Juvenile offenders neighbourhoods of origin – social disorganisation theory

Robert Sampson – Chicago School approach to the study of crime – collective efficacy

But the vast majority of empirical studies on crime and place focus on crime hotspots in terms of crime incidences
Defining neighbourhoods: Output Areas

- 171,372 output areas in England;
- Population thresholds:
  - 100 to 625 people
  - 40 to 250 households
How can we identify the over-representation of shop theft offenders in different neighbourhoods?

Share of all shop theft offenders in the City living in neighbourhood A

DIVIDED BY

Share of all crime offenders in the City living in neighbourhood A

LOCATION QUOTIENT

LQ > 1 = over-representation of this type of offender
Output Area Classification 2011

Socio-demographic characteristics, household composition, deprivation, economic participation

Hierarchical cluster analysis

Supergroups (8) Groups (26) Subgroups (76)
‘Cosmopolitan’ neighbourhoods

- Densely populated urban areas;
- Living in flats and communal establishments - private renting more prevalent;
- High ethnic integration - above average number of residents from EU accession countries;
- Households less likely to speak English as their main language;
- Young adults - higher proportion of single adults and households without children;
- Higher proportions of full-time students;
- Predominantly employed in the accommodation, information and communication, and financial related industries - and using public transport, or walking or cycling to get to work.'
### Empirical analysis: Which neighbourhoods matter?

<table>
<thead>
<tr>
<th>Neighbourhood type</th>
<th>Number of Output Areas</th>
<th>Mean Shop Theft Location Quotient Score</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosmopolitan</td>
<td>120</td>
<td>1.14***</td>
<td>.78</td>
</tr>
<tr>
<td>Ethnicity Central</td>
<td>67</td>
<td>1.20***</td>
<td>.51</td>
</tr>
<tr>
<td>Hard-pressed Living</td>
<td>155</td>
<td>.73 ***</td>
<td>.49</td>
</tr>
<tr>
<td>All neighbourhoods</td>
<td>990</td>
<td>.94</td>
<td>.62</td>
</tr>
</tbody>
</table>

*** Significant at 99.9% confidence interval    NS not significant
Does this differ in terms of where shop theft offenders head to commit their crime? (Mean Shop Theft Location Quotient Score)

<table>
<thead>
<tr>
<th>Neighbourhood type</th>
<th>City Centre:</th>
<th>High Street:</th>
<th>Elsewhere:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosmopolitan</td>
<td>.84NS</td>
<td>.99NS</td>
<td>.46NS</td>
</tr>
<tr>
<td>Ethnicity Central</td>
<td>1.04***</td>
<td>1.09***</td>
<td>.57***</td>
</tr>
<tr>
<td>Suburbanites</td>
<td>.86NS</td>
<td>.68***</td>
<td>.27NS</td>
</tr>
<tr>
<td>Constrained City Dwellers</td>
<td>.79***</td>
<td>1.19***</td>
<td>.53***</td>
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<td>1.03</td>
<td>.36</td>
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Policy implications:

• **Neighbourhoods characterised by transition** are the primary locations where shop theft offenders are disproportionately found;

• **Proximity of neighbourhoods to city centre mediates the level of risk**;

• Once offence location is taken into account, **only transitionary neighbourhoods characterised by ethnic diversity** pose a significant threat;

• More complex inter-play between retailer location, neighbourhood characteristics, the concentration of shop theft offenders, and the distance travelled to crime;

• Decisions by retailers over where to locate **should be informed by the shop theft offender profiles** of nearby neighbourhoods as much as by the consumer household characteristics of these areas.
Thank you for listening

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