Designing for the future against crime and terrorism

DESIGN AGAINST CRIME

Paul Ekblom

Design Against Crime Research Centre

Central Saint Martins College of Arts & Design

University of the Arts London

Every design is a bet on the future

- Can product be made?
- Will it work?
- Will it last or fall to bits?
- Will it sell at a profit – what's the competition?
- Will people use it as intended?
- *Will it be involved in crime?*

What is Design Against Crime?

DAC uses the tools, processes & products of design to work in partnership with agencies, companies, individuals and communities to

- prevent all kinds of **crime** – including antisocial behaviour, drug abuse/ dealing and terrorism
- promote quality of life & sustainable living through enhanced **community safety**

through designs that are 'fit for purpose' and contextually appropriate in all other respects

…and DAC can be quirky too

Scope of Design Against Crime

- Secure products
- Security products
- Security components
- Security features/ furniture
- Secure systems
- Secure information
- Security communication/ art
- Secure clothing
- Secure places/ environments
- Secure communities

Design is about *processes*, not just products!

Inherently secure product … then

…and now -
Vexed Generation/ Puma

Hard or soft target?

Evolution of a secure product – Preventing the clipping of coins

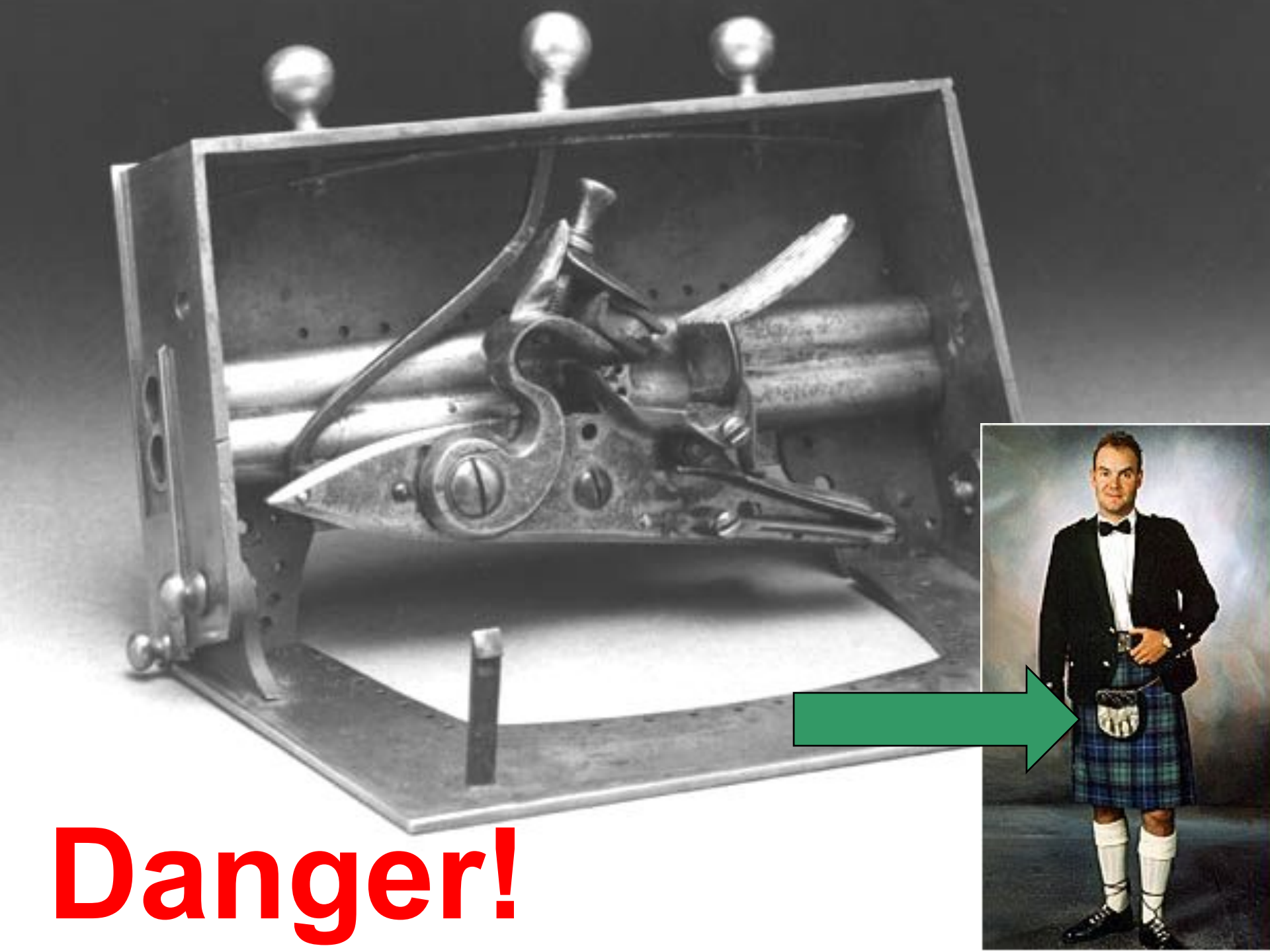
Hammered

Milled

Security product –

Clothes tagging device

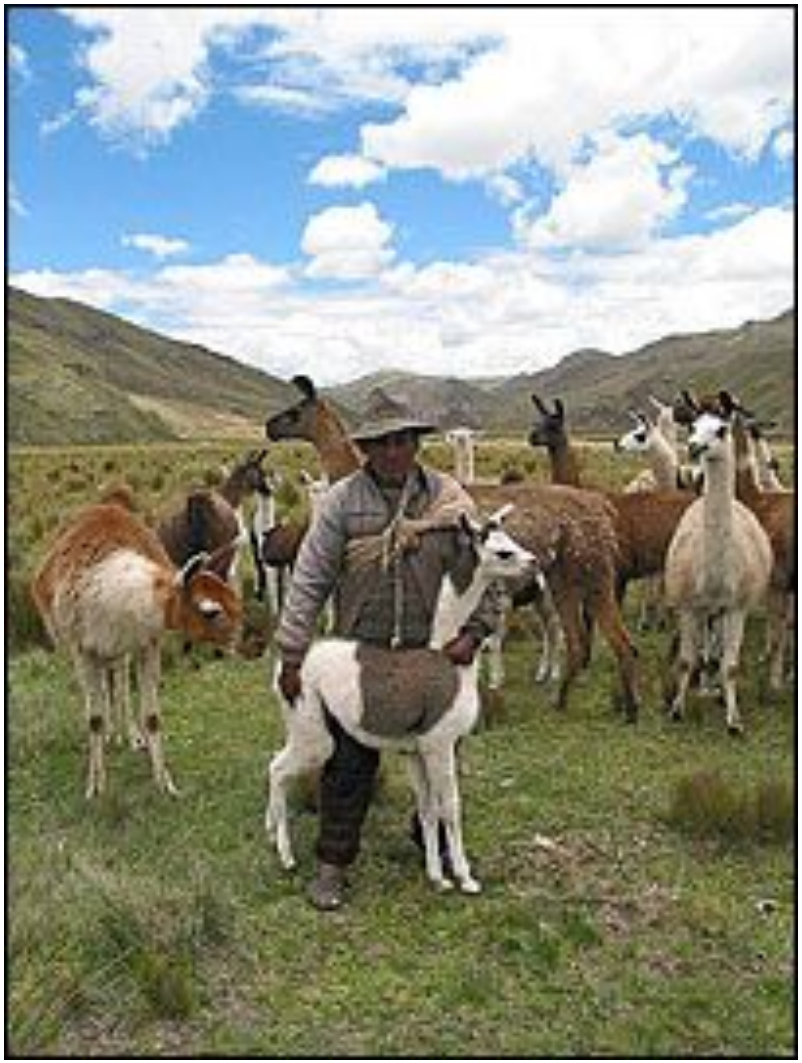
Security Product/ Security Communication


Danger!

Security component – Brand Protection

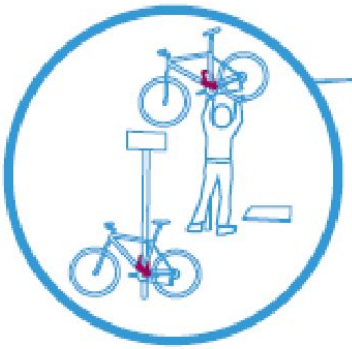
Security Features/ Furniture/ Accessories

Security System – Chips Protect High-Value Alpacas



Security Communication

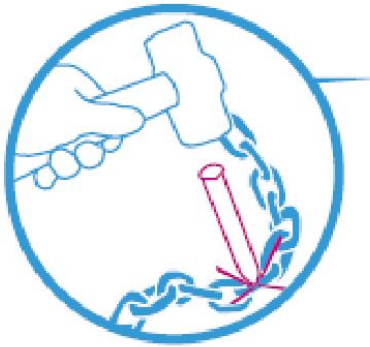
Common Perpetrator Techniques



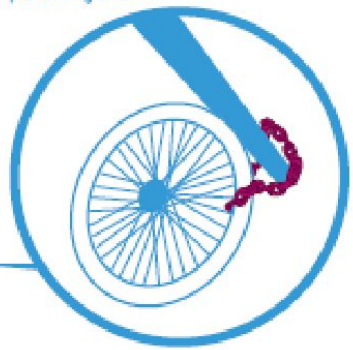
Up and Over (Lifting): Thieves remove the top of the post (possibly a sign), and lift the bicycle off. They often replace the top afterwards.

Mind the Gap (Leverage): Thieves use the gap between the bike and the stand left by a loosely fitted lock to insert tools such as jacks, croppers or jemmies or may twist the bike against the lock to break it free.

TIP - Always lock frame and both wheels to a cycle stand



Breaking the chain (Impact): Thieves take advantage when the chains or locks are in contact with the ground and use a hammer and cold chisel to split them. Cheaper D-locks are vulnerable to a direct strike against the protruding end.

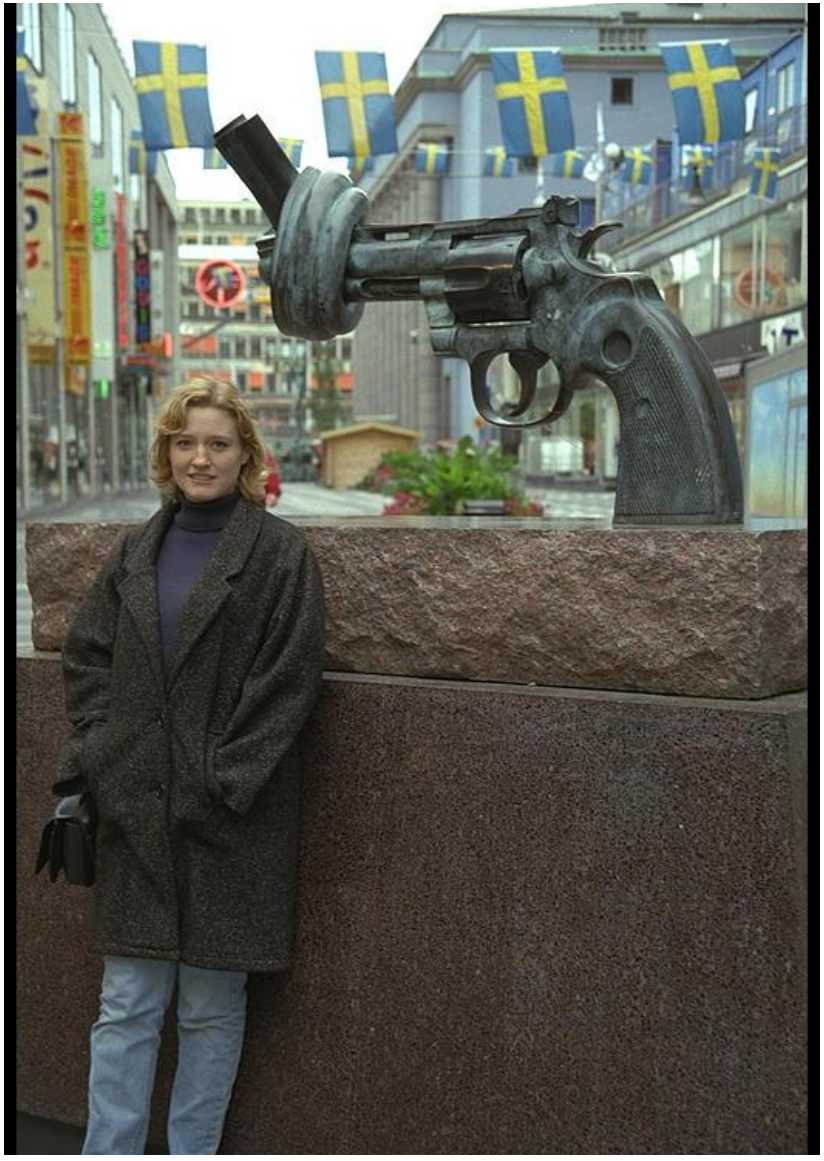


Parking Error (Unbolting): Only one lock has been used, and thieves steal the rest of the bike. Any easily removable part of the bike is vulnerable, unless locked up or removed by the owner.

TIP - Don't ride with valuables in open baskets or panniers

TIP - If you cannot use a cycle stand, please respect others' property when parking

Security Communication/Art



Security Clothing – Wearable Solutions

Secure Place: Maiden Castle

Secure Communities

Designing for social cohesion & conflict reduction

Hi-tech solution

Lo-tech solution

Note that here, security derives from combined features of product and place

Does DAC work?

- Car theft
- Mobile phone cloning
- Underground ticket machine slugs
- Secured By Design/CPTED
- But more hard evidence needed

The challenge of DAC

The challenge of DAC: **Troublesome Tradeoffs**

Can we design secure products *without* jeopardising their main purpose and *without* their being

- Inconvenient?
- User-unfriendly?
- Ugly? Effective but hideous & clunky engineering solutions
- A threat to privacy?
- Environmentally unfriendly?
- Unsafe?
- Too expensive?

Yes! Tradeoffs can be resolved…

- **Where Design Expertise is fully engaged, early in the Design Process**
- **And all these considerations are incorporated in the Requirements Capture with sufficient priority**

Secure products need not be ugly

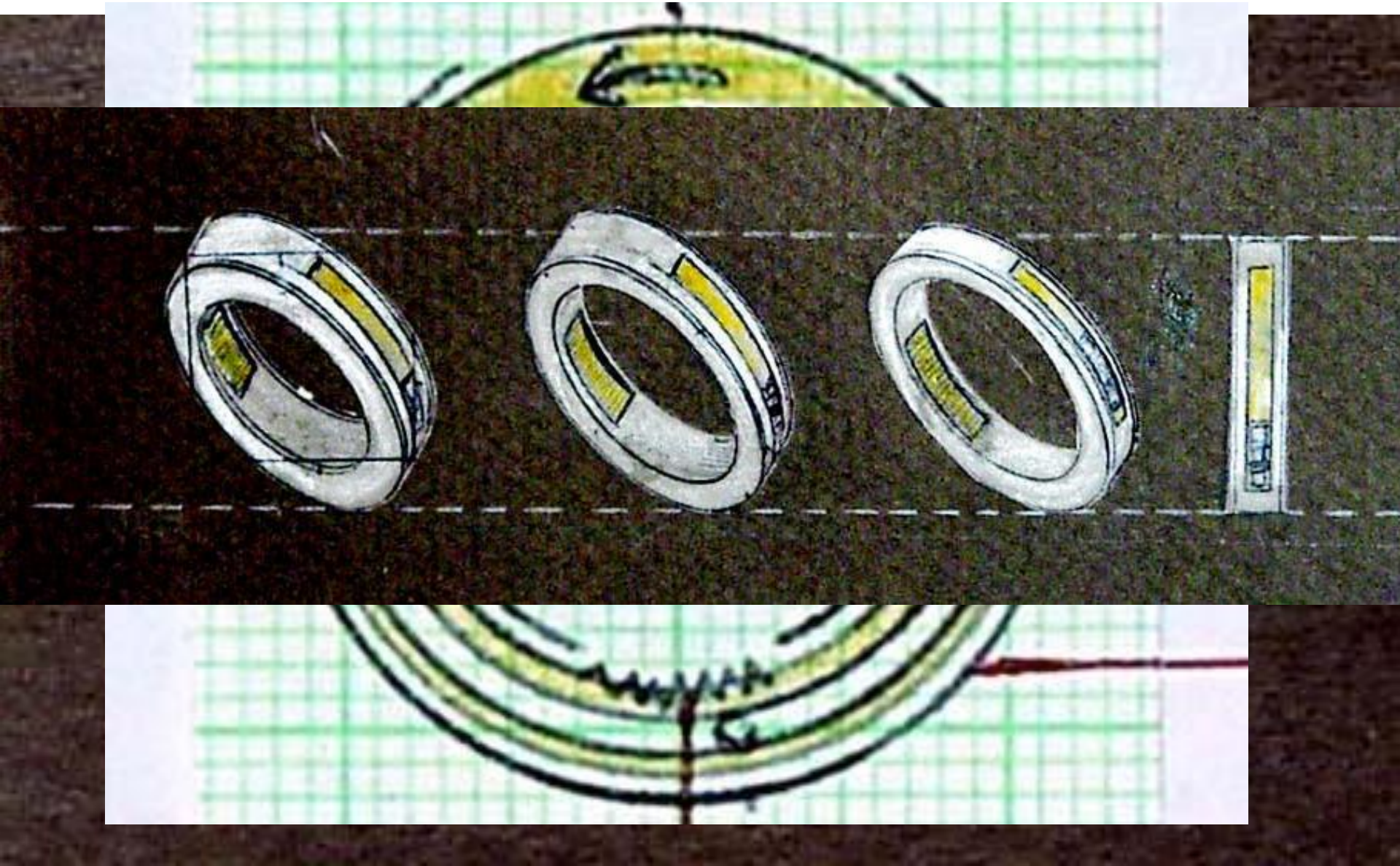




Anti-Terrorism need not be frightening

DAC doesn’t have to be expensive

Subtle and dynamic – the ultimate tradeoff?



The challenge of DAC – **Caught unaware – failure to anticipate**

- Product designed naïve to crime
- Crime harvest
- Retrofit solutions
  - Constrained
  - Rushed
  - Legacy of crime and/or inconvenience

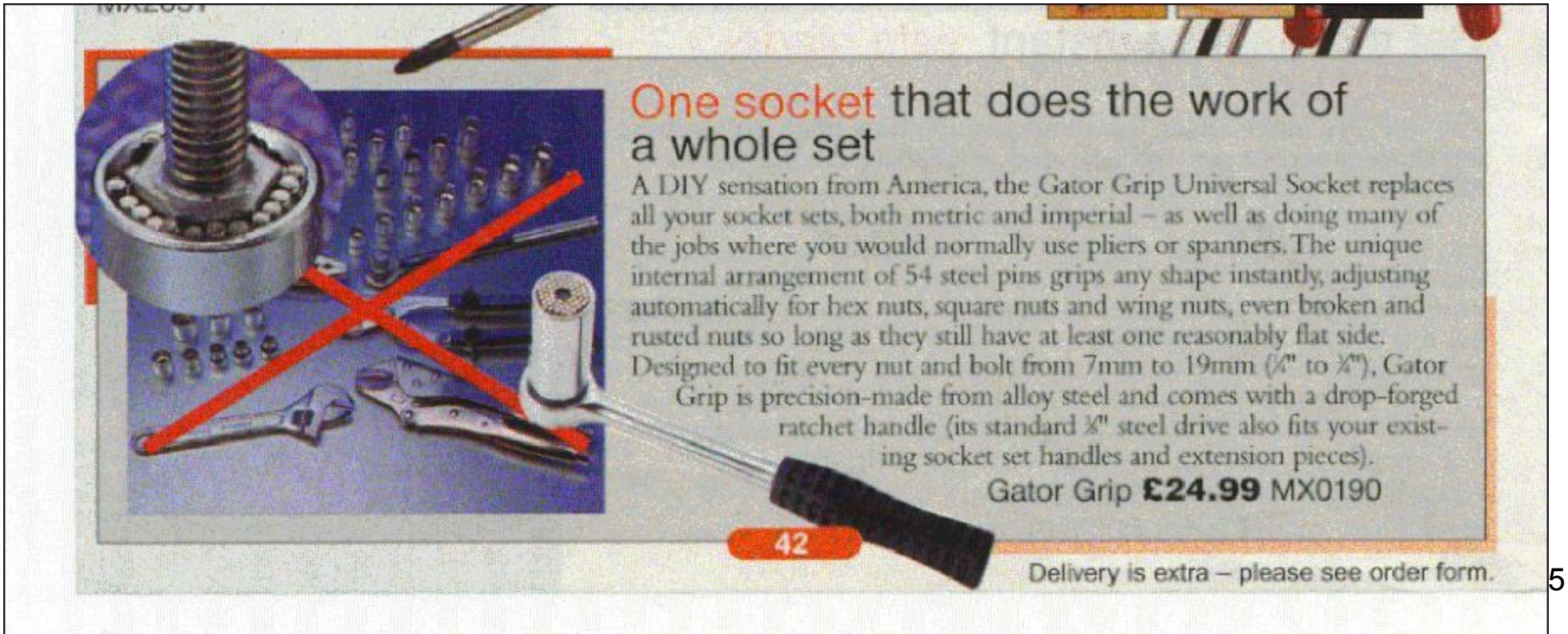
What made Queen Victoria go red?

The challenge of DAC – **Offenders fight back**

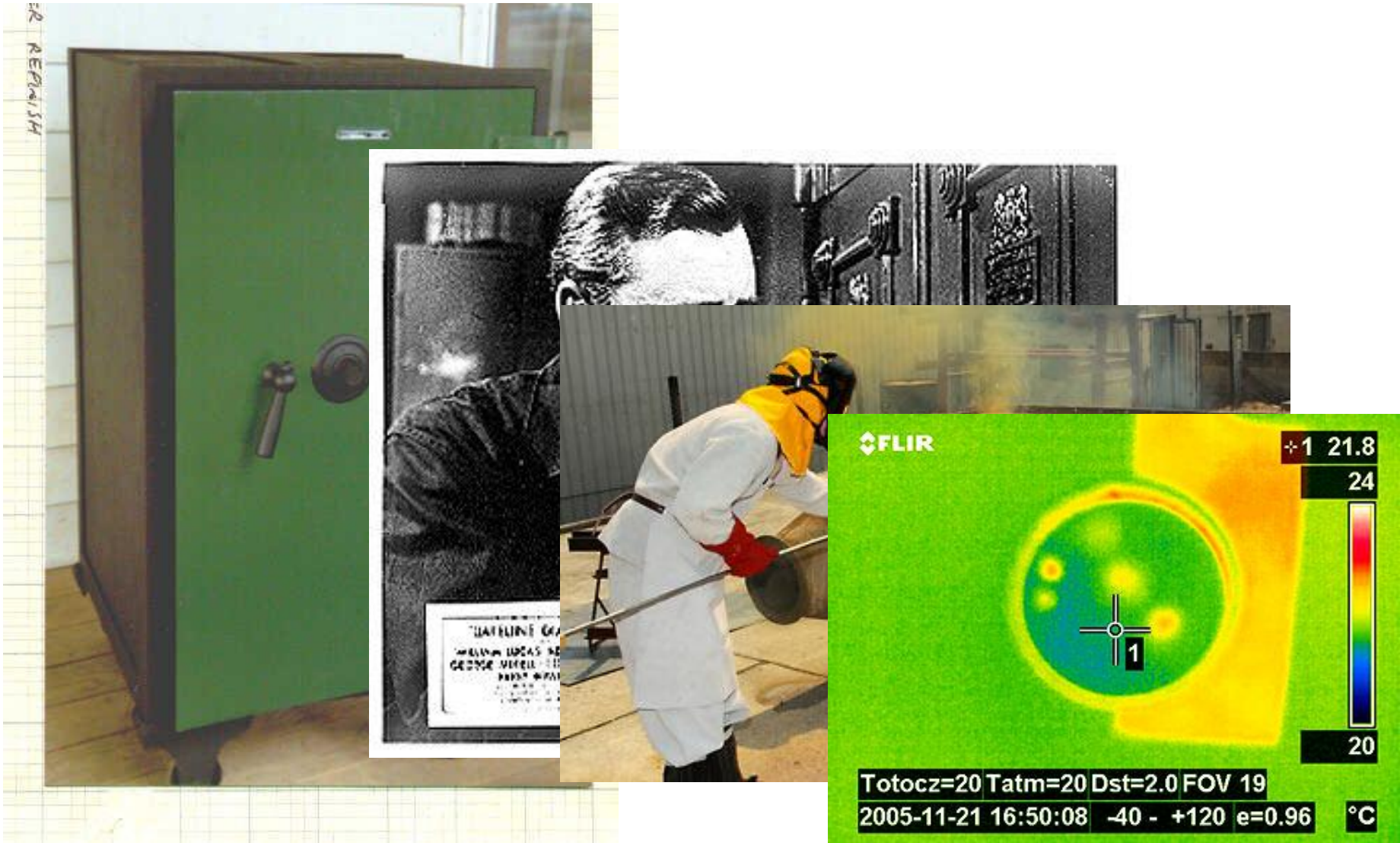
- Tactical countermoves
  - in situ
  - return better tooled
- Counter-exploitation
- Strategic counter-design
- Reverse engineering

The challenge of DAC – **Obsolescence**

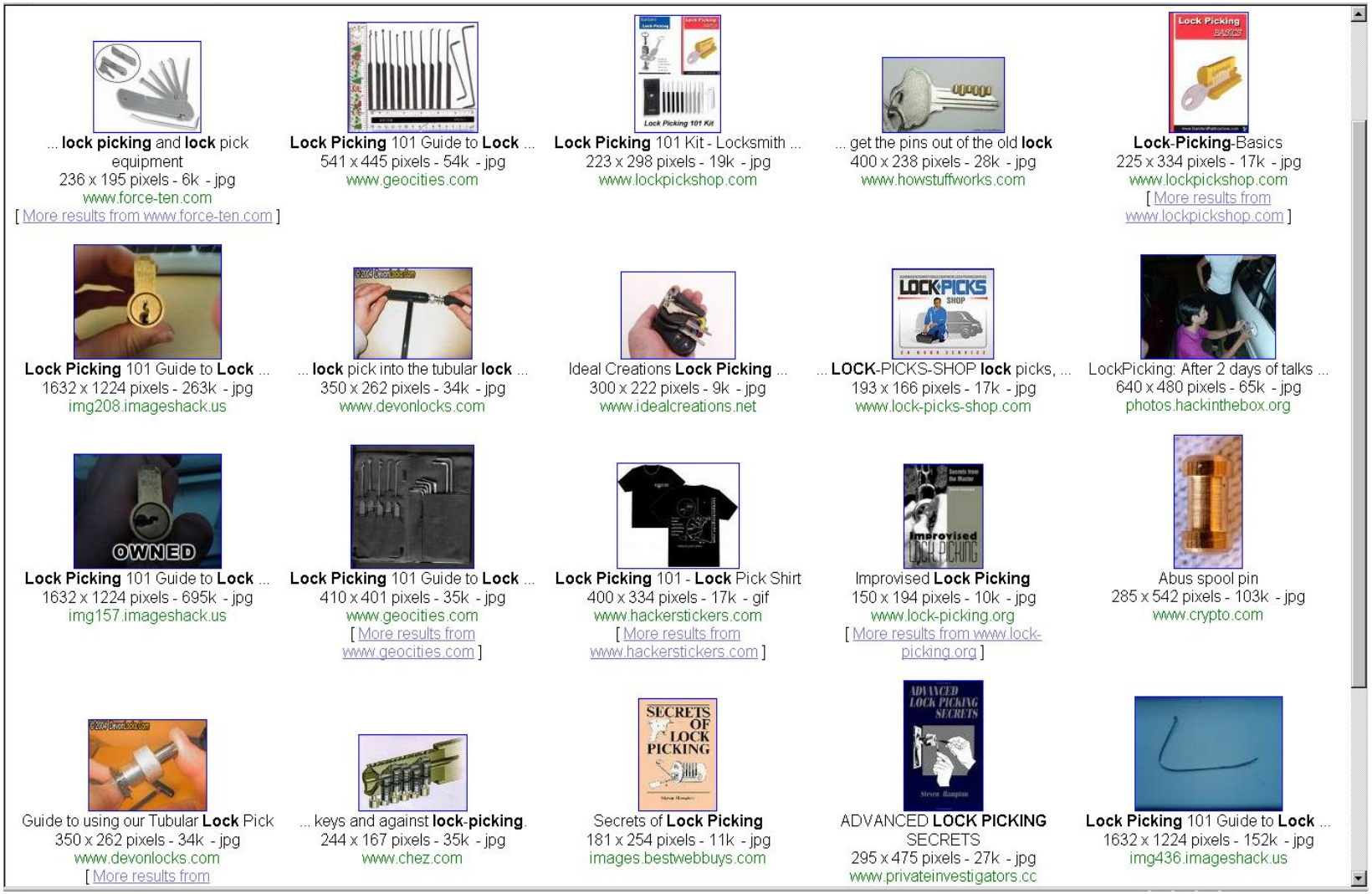
- Adaptive offenders' countermoves
- Changing social conditions
- New tools/ skills for crime



Arms Race –
Safes and Safecrackers



Spread of criminal know-how – from pubs & prisons to the Internet

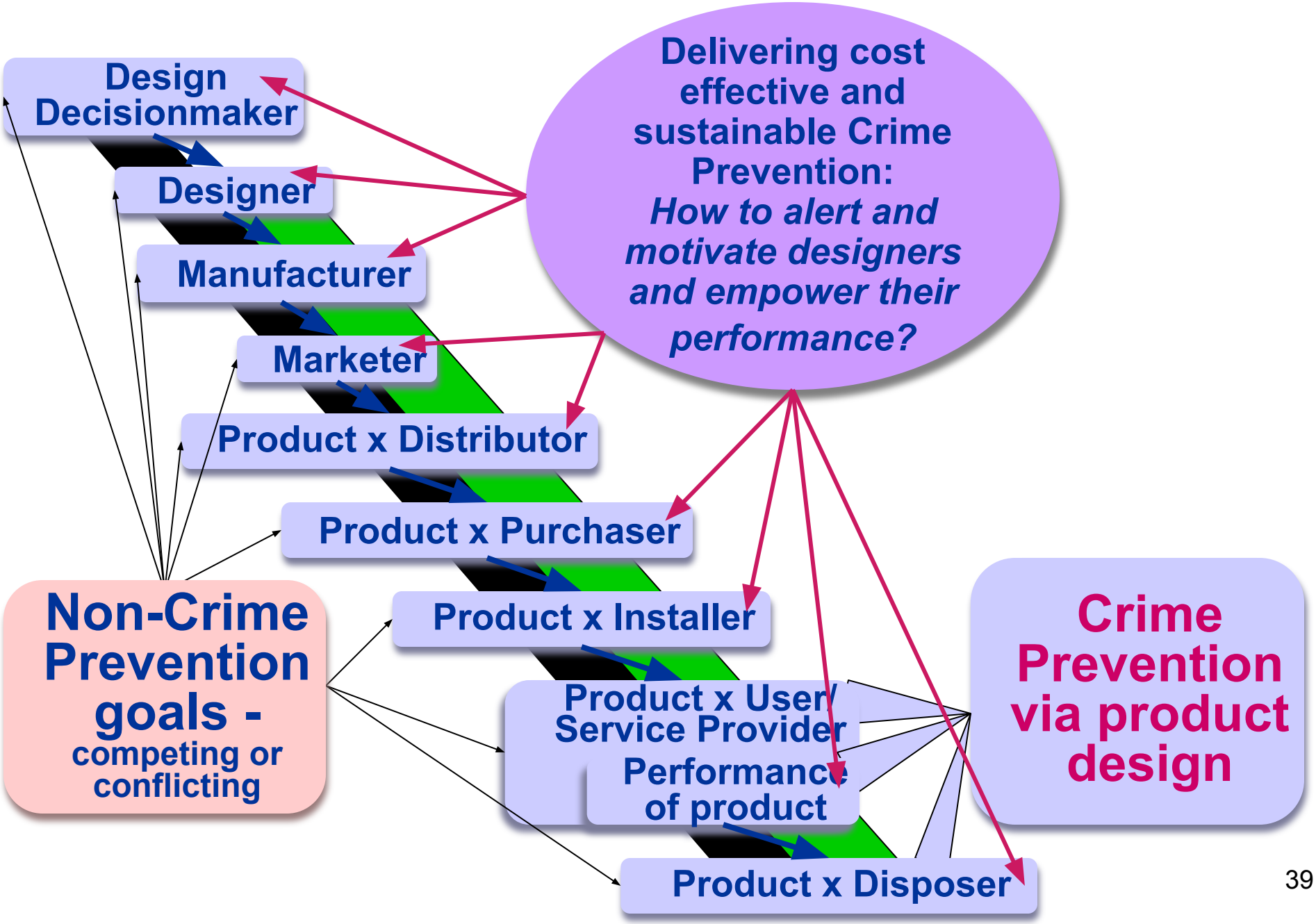


Beware cookbook copying – Importance of context for replication

ELECTRONICALLY SECURED CYCLE PARKING

GHENT, BELGIUM

WALTHAMSTOW CENTRAL STATION, LONDON


Design Decisionmaker
Designer
Manufacturer
Marketer
Product x Distributor
Product x Purchaser
Product x Installer
Product x User/ Service Provider
Performance of product
Product x Disposer
Delivering cost effective and sustainable Crime Prevention: How to alert and motivate designers and empower their performance?
Non-Crime Prevention goals - competing or conflicting
Crime Prevention via product design

Meeting the challenge

- We have to innovate faster than offenders whilst adapting to context of users and crimes
- This needs
  - Motivation
  - Capacity development
  - Collaboration between Preventers and Designers

Design – product or process?

- Is design what we make, how we make it, or both?

Implementing DAC through process:

Getting designers to

Think Thief

…and

crime preventers to

Draw on Design

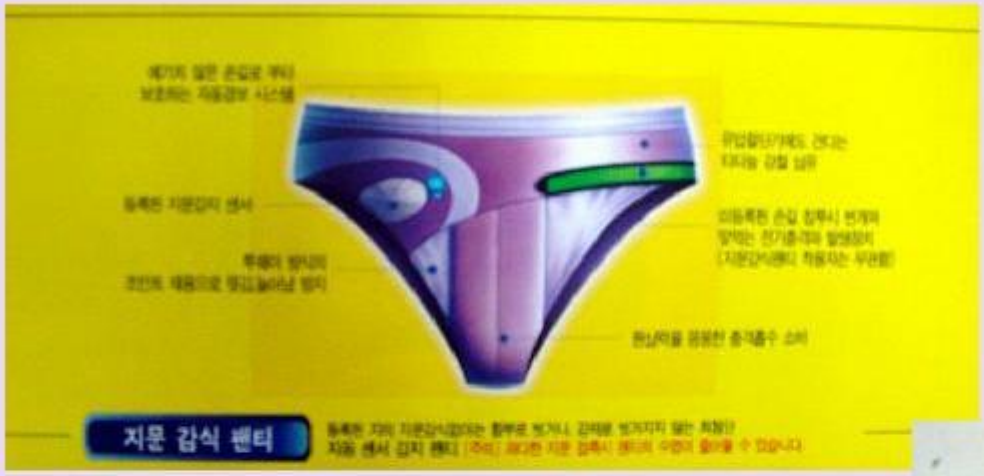
Helping designers think thief – Developing & building capacity for DAC

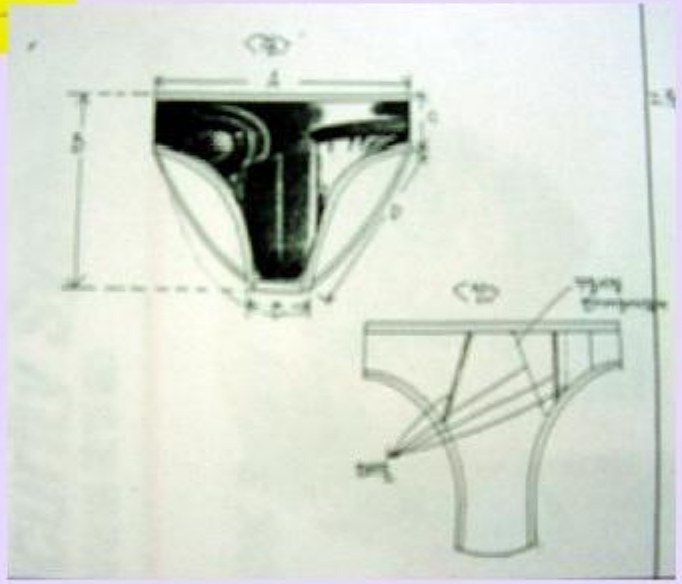
- Mindset
- Clear definitions – tools for thought
- Knowledge for interventions
- Knowledge management – capturing & replicating good practice and supporting innovation without stifling creativity
- Anticipation

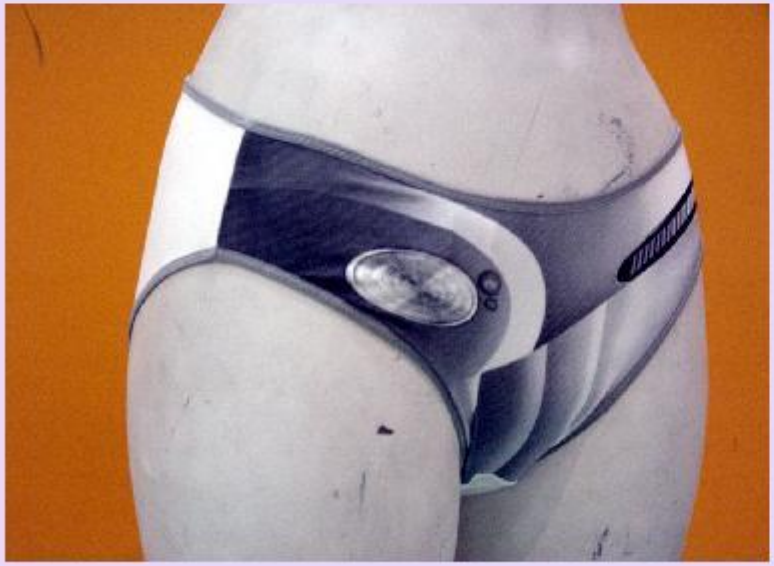
A receptacle for grime?

Or a tool for crime?

Wrong mindset for design: failure to think thief







But beware… Magnificent Obsession?

Giving designers knowledge from crime prevention – Maps and frameworks

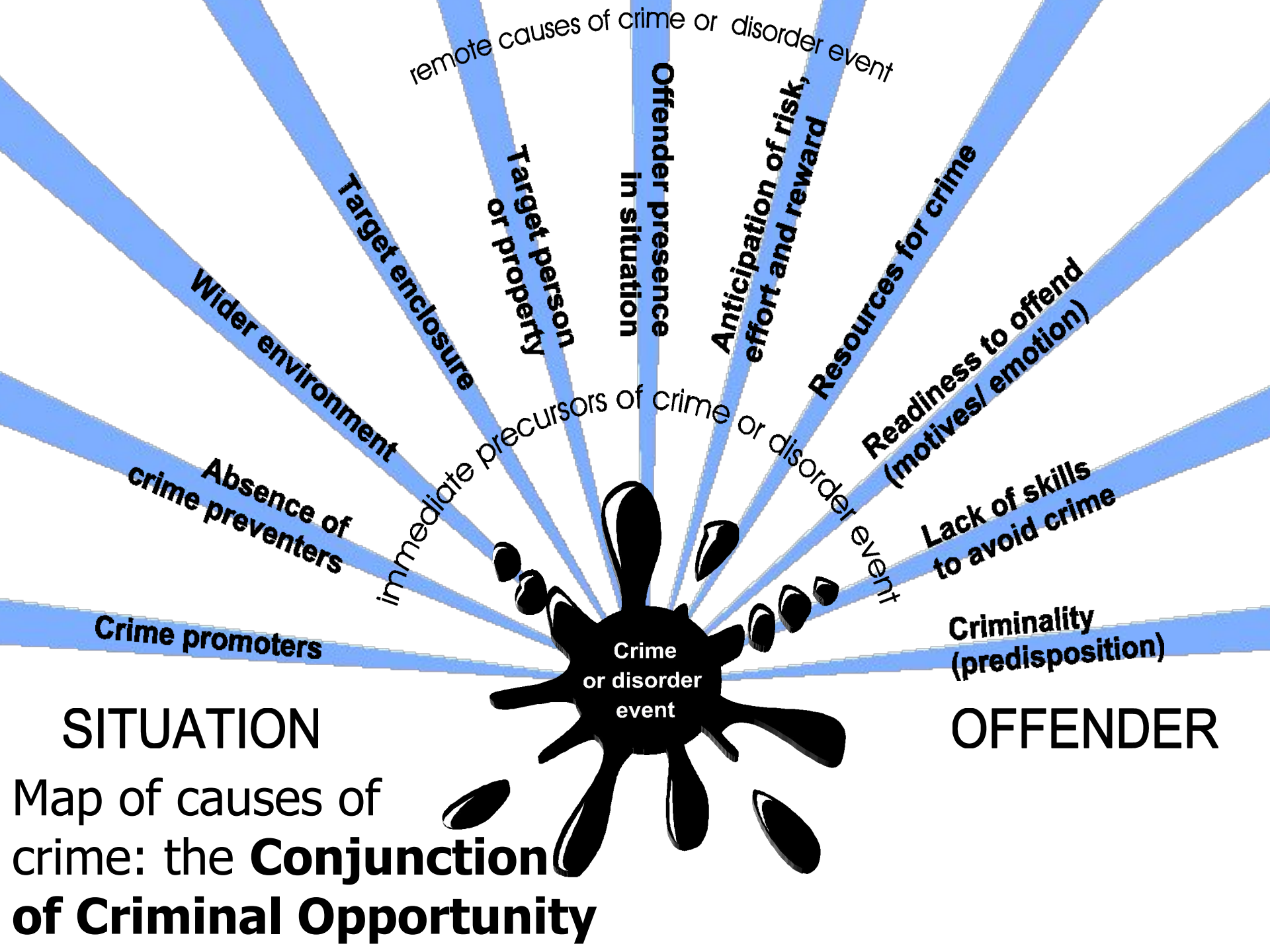
- Importance of *Rationale* for design –

  Problem, consequences and context

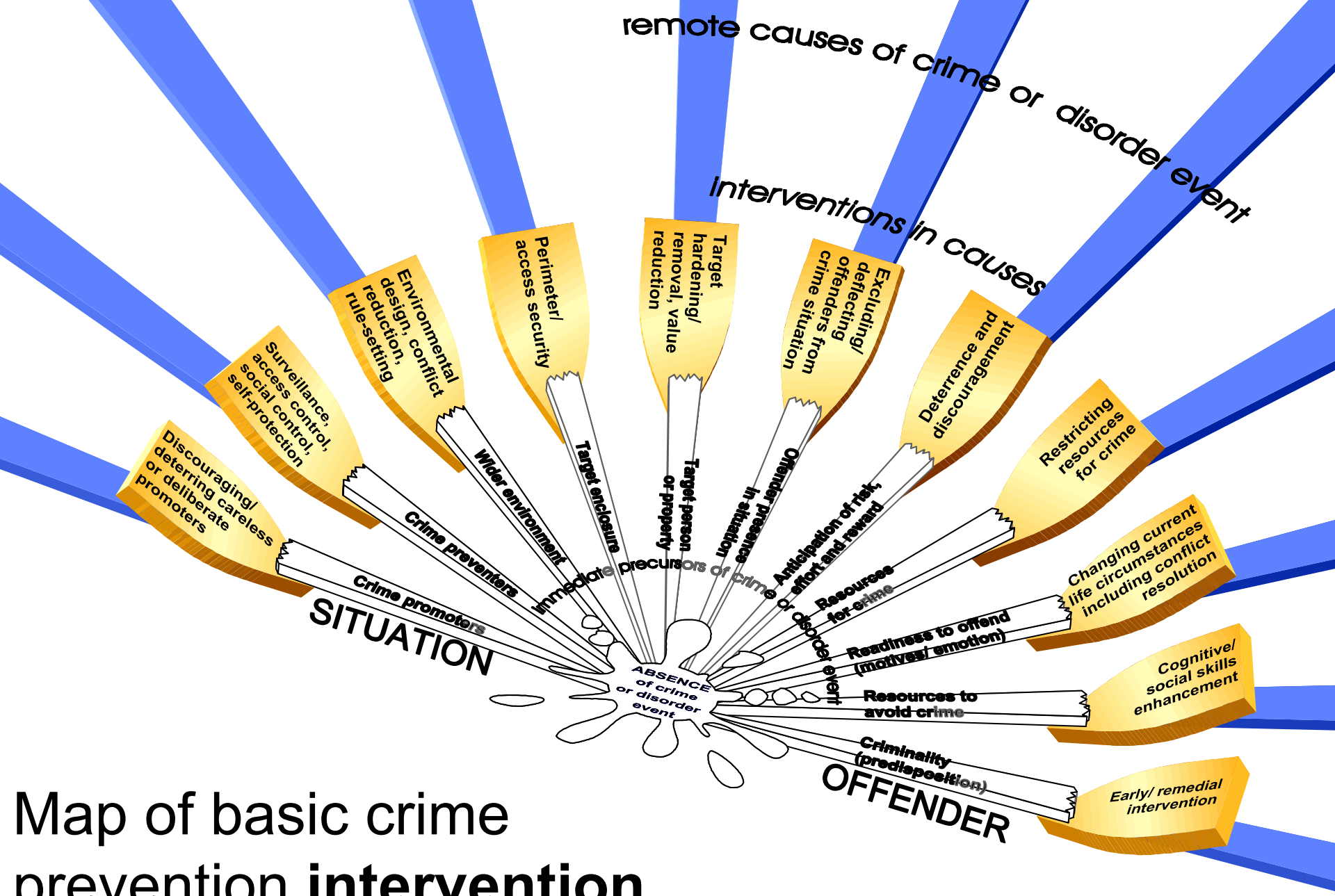
  - Causes
  - Intervention principles
  - Intervention practice

Can use Crime Triangle, or RAT

But I prefer…

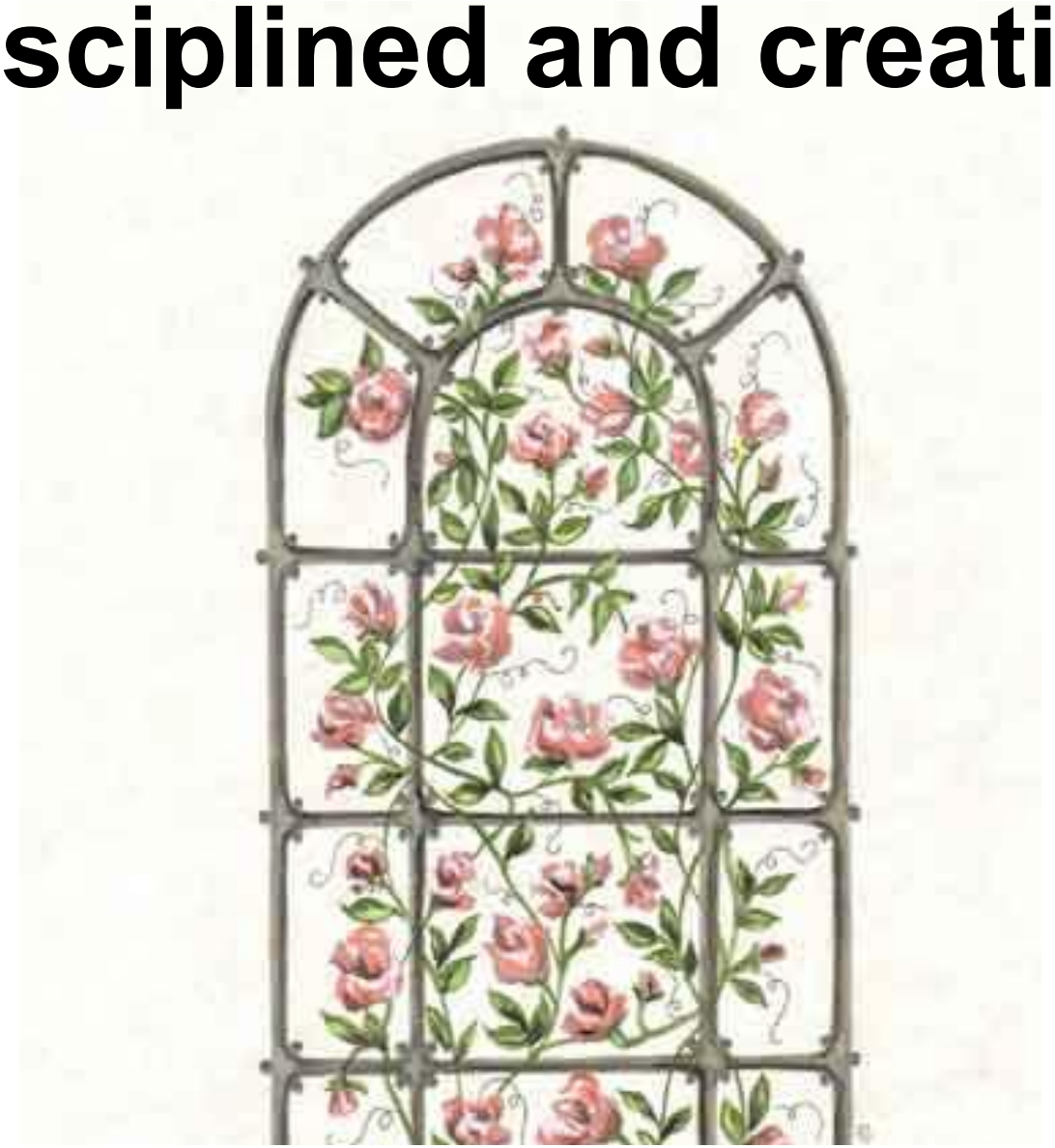


Map of causes of crime: the **Conjunction of Criminal Opportunity**

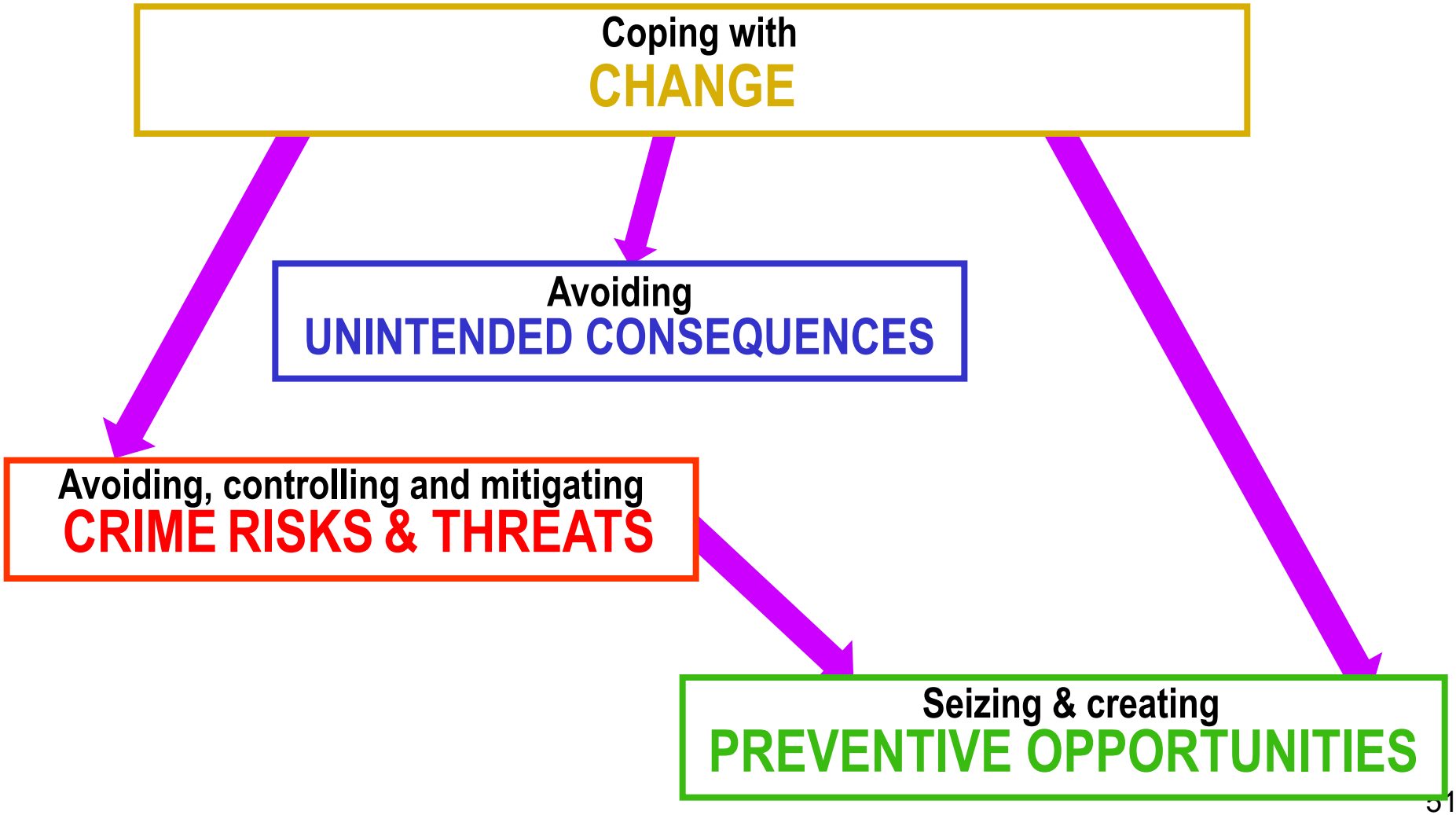


Map of basic crime prevention **intervention principles**

But… designers must be both disciplined and creative



Anticipation in Crime Prevention

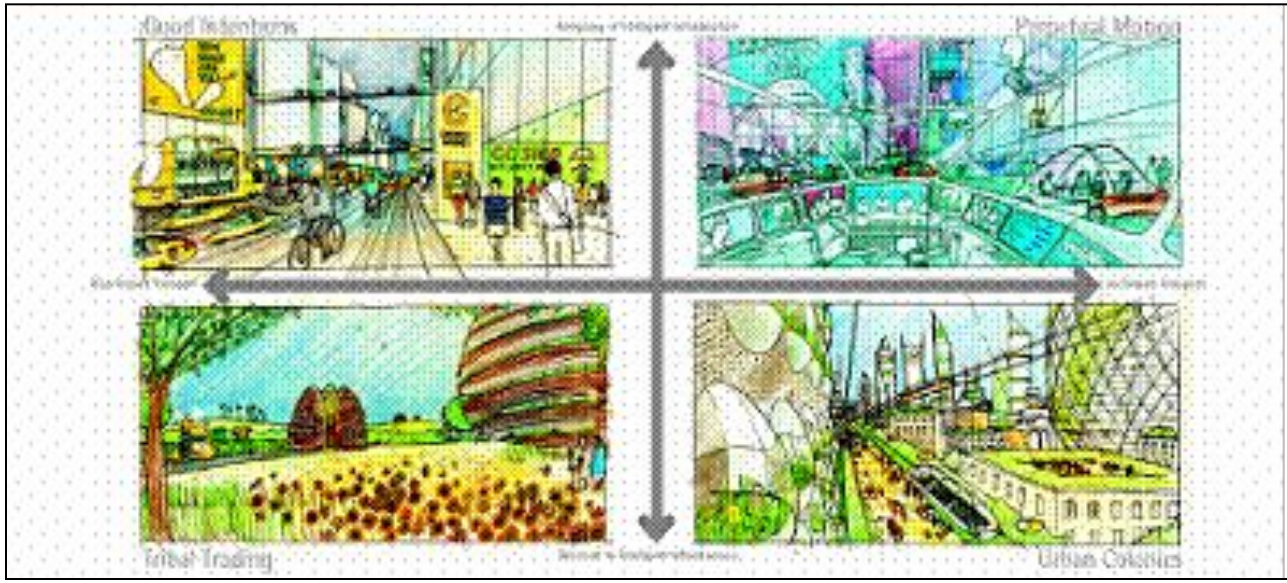


The **Anticipation** dimension

- **Crime Risk Assessment** – specific **incoming** threats from elsewhere affecting one's own activity
- **Crime Impact Assessment** – specific **exported** threats from one's own activity
- **Horizon Scanning**
  - All-encompassing approach over a range of timescales eg 5-50yrs
  - needs wider knowledge of **trends** and forecasting of **events** over 'PESTLES' dimensions (political, economic, social, technological, legal, environmental, scientific) and their interactions
  - Makes plausible forecasts backed by **evidence, theory and logic** – inexact but not wild guesses or fringe ideas
  - Helps manage a **range** of risks and opportunities – 'futures thinking', not 'predicting a specific future' – policy and practice designed to be **robust across this range**

Crime and design - futures

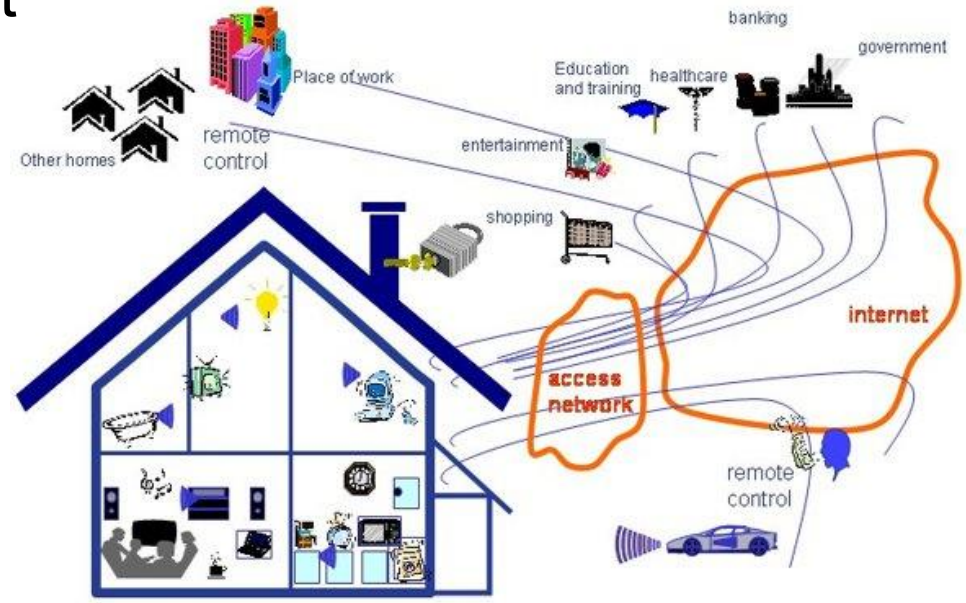
- Changing crime – new tools, new targets
- Changing priorities
  - Sustainability
  - Low energy
  - Resilience to climate shift, terrorism
  - Privacy/freedom v security



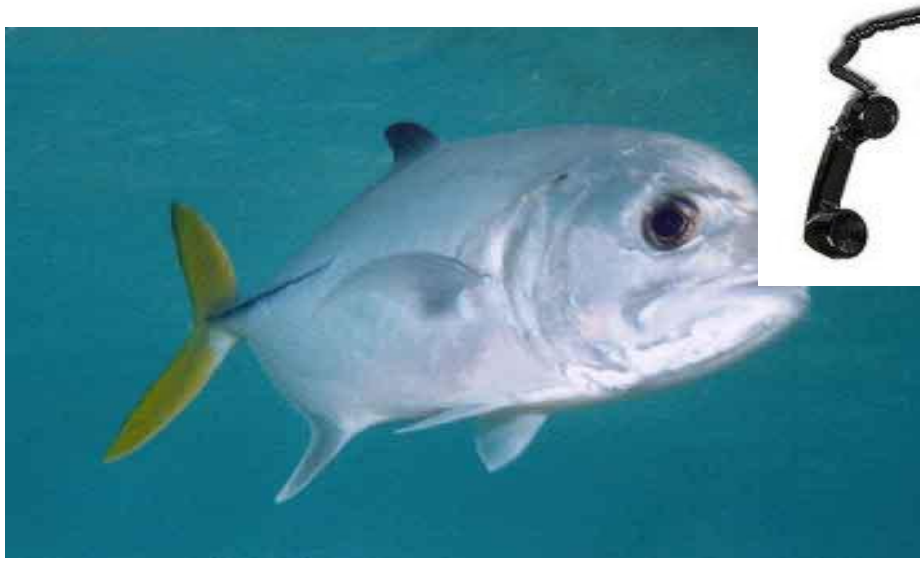
Crime and design - futures

Changing context on all scales – crime threats and CP opportunities

- New land uses
- Blur between products, places, systems
- Intelligent homes/products linked to internet
- Automobiles v public transport
- Cameraphones – changing nature of ‘eyes on street’
- Intelligent CCTV, multimodal alarm systems
- New materials – sensitive, resilient, anti-graffiti?



How to Anticipate – Building on knowledge of correlations & causes



- Empirical approaches
  - Projection of linear trends
  - Statistical modelling of cycles etc – eg time series techniques
  - Risk and protective factors - CRAVED
  - But - **nonlinearities**
- Theory and logic
  - In each case we can use CCO (as an integrated map of theories) to systematically ask **'Will the forecast changes affect *this* cause of crime, beneficially or harmfully? The potency and implementability of *this* preventive intervention?'** Can home in further by additionally using **types** of crime threat or of crime problem
  - Major issue with all theory is that many causes **interact** – CP theory has limited knowledge of such interactions
- Simulation – software agent-based modeling – may be able to explore emergent processes from these interactions

Misdeeds & Security Framework – for anticipating types of crime threat & crime prevention opportunity from scientific & technological innovations

Misdeeds (Ms)	Security (Ss)	
Misappropriated - stolen	Secured against theft	
Mistreated – damaged	Safeguarded against damage	
Misused – tool/weapon for crime	Shielded against misuse	Supporting justice/ crime reduction/ community safety
Mishandled – fraud, counterfeit	Scam-proofed	
Misbehaved with – disorder/ASB	'Sivilised'	
Mistaken – false alarm	Slip-proofed	
Mistrusted/ Misunderstood	'Sertain' to report/ understand	
Misaligned – adverse side effects	Straightening adverse side-effects	

Developing fundamental capacity – Theory into practice – from risk analysis to design guidance

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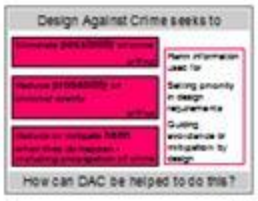

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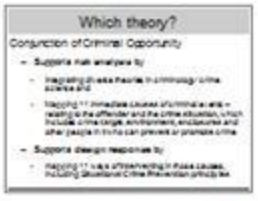

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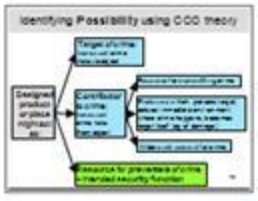

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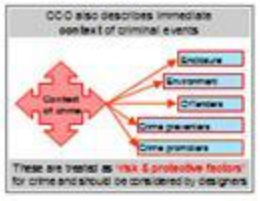

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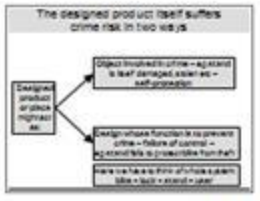

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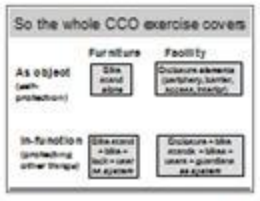

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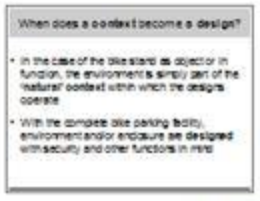

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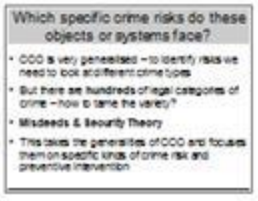

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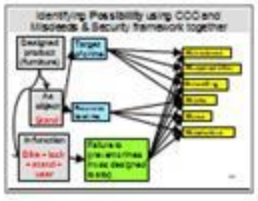

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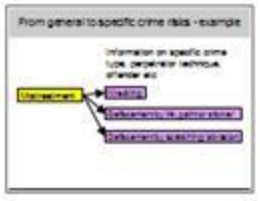

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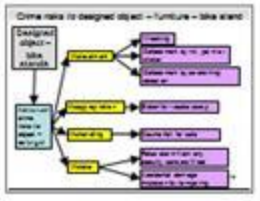
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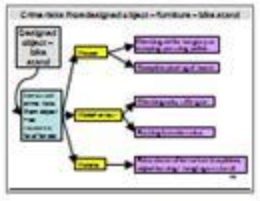
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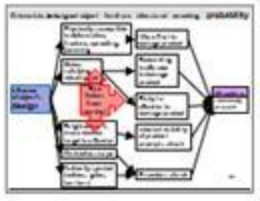
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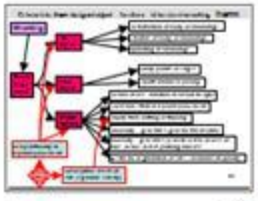
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www.bikeoff.org/tags/presentations/

Risk factors for Misappropriation

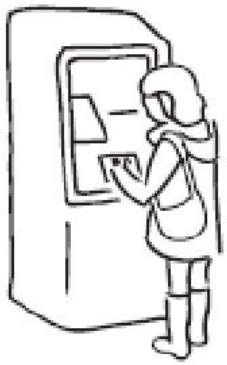
Hot Products

- **C**oncealable
- **R**emovable
- **A**vailable
- **V**aluable
- **E**njoyable
- **D**isposable

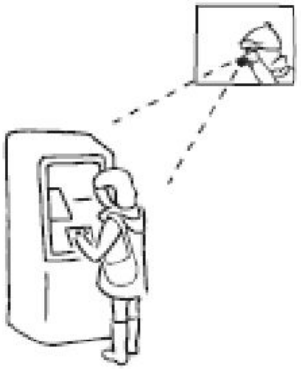
The dynamics of crime – Modus Operandi

Human Centred MO's

ATM Machine Use



Obtaining PIN Number

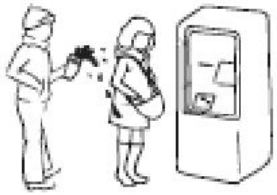


Remote Observation

Shoulder Surfing

Obtaining Card – Distraction

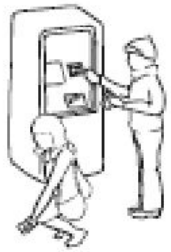
Distraction using other money



Distraction by spillage on victim

Victim distracted by being bumped into – Tag Team technique

Obtaining Card and/or Cash – Acquisition



Taking cash and/or card from machine while victim distracted

Bag dipped for cash and/or card while victim distracted

Victim robbed using threats or force for cash and/or card

Capturing dynamics of crime events – Scripts

- In situations which people repeatedly encounter – eg getting cash out of an ATM – they learn which actions work best
- Result of this learning is a cognitive **script** – a structured sequence of things to **attend to,** and things to **do/avoid,** in achieving some **purpose** or **goal**
- Scripts may be associated with particular **roles** – with crime, these roles are **offenders, preventers, promoters**
- A **user/preventer** script:

  Find ATM, get out card, use card/ATM, recover card, take cash, leave
- An **abuser/offender** script:

  Find ATM, find ambush site, await ATM user with money in hand, snatch money, flee

Script *clashes* – the pivots of design

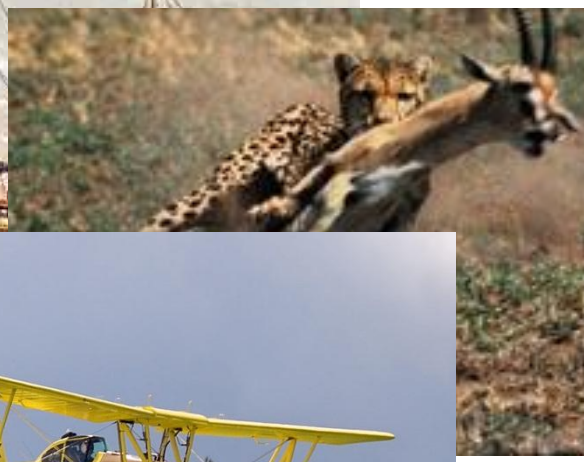
- Offenders and users may have conflicting goals, causing tactical **script clashes**:
  - Surveill v conceal
  - Exclude v permit entry
  - Wield force v resist it
  - Conceal criminal intent v detect criminal intent
  - Challenge suspect v give plausible response
  - Surprise/ambush v warning
  - Trap v elude
  - Pursue v escape…
- Designers' task is to arrange the situation
  - to favour the user over the abuser in each of these tactical clashes in terms of the shifting dynamics of risk of harm, effort, reward – so the story ends with the bad guy losing! Alternatively,
  - to arrange the wider environment to avoid the clashes happening at all

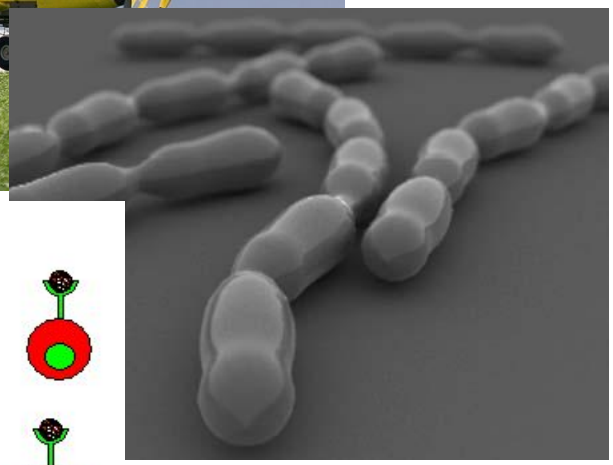
Gearing up against crime – A dynamic strategy for arms races

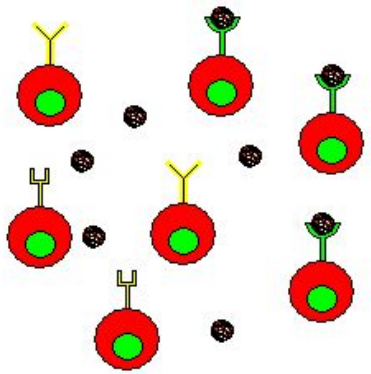
- Encourage variety
- Design to performance standards/ generic principles
- Study offender resources – current and future
- Exploit new technology for prevention
- Avoid rigidity and lock-in
- Future proofing
- Pipelines
- Learn from other **evolutionary struggles**

Learning from other struggles

- Military
- Predator-prey
- Pest-farmer
- Bacteria-antibiotic
- Immune system-virus







Boosting inventiveness to cut crime whilst respecting the tradeoffs

- **TRIZ** – a theory of inventive principles
- Based on analysis of **oodles** of patents
- 40 generic **Inventive Principles**
  - Including the comb-over?
- 39 **Contradiction Principles** – the sharper-expressed the contradiction, the easier the problem to solve…link to troublesome tradeoffs and the fundamental contradiction at the heart of crime prevention (user-friendly, abuser-unfriendly)
- **Lookup tables** – what inventive principles solved what contradictions in past?
- Analysis of **evolutionary trends** of invention (solid > segmented > flexible > field) – look for what's likely to be next to limit search for next solution

Describing designed interventions – *Security Function Framework*

- Purpose

What crime problem/s does the design address?

- Niche

How does the design fit within the ecology of security?

- Mechanism

How does the design work in preventing crime?

- Technology

How is the design realised through materials, construction and operation?

Case study – the Stop Thief Chair

Stop Thief Chair – Security Function Statement

Purpose

- *Principal* purpose to serve as a fully functional chair
- Subsidiary purpose to reduce risk of *theft* of *customers' bags* in *bars and restaurants*
- *Desire requirements* – stylish, economical, protects reputation of venue as safe, caring place
- *Hygiene requirements* – physically safe, sustainable

Security niche

- A *securing* product

Stop Thief Chair – Security Function Statement

Mechanism

- Supplies physical *anchorage* of target bag, that is differentially easier to release by bag-user
- Mobilises people to *use the security function of the chair,* and consequent *surveillance and reaction*
- Protects bag within user's 'personal defensible space'
- *Deters* through increasing offender's perception of risk of being detected and caught in the act

Technicality

- *Twin notch feature* cut in leading edge of seat, over which the bag handle is placed
- Bag then anchored by its handle being enclosed between seat and back of user's knees

The ExRes Railway Carriage Counterterrorism design security function spec

Purpose

Principal purpose

- To serve as a fully functional and appropriately-adapted railway carriage

Subsidiary purpose

- Minimise passenger injuries from explosives detonated either inside or outside of the carriage

Desire requirements

- For *Train Operating Companies*, desire requirements include
  - Economical
  - Easy to clean/maintain
  - Does not scream ‘terrorist risk’ (hence ‘tidy and safety’ purposes)
  - Fits décor
  - Satisfies societal hygiene functions to meet obligations/regulations

Desire requirements

- For *customers*, desire requirements include
  - Attractive, comfortable, reassuring
  - Easy to use
  - No risk of injury or damage to clothing
  - No looking uncool or embarrassed about concern with security
  - No risk of forgetting bag on departure from carriage

Hygiene requirements

- For *Society*, hygiene requirements include
  - Health and safety – doesn't jeopardise crashworthiness
  - Sustainability – low carbon in production
  - Inclusiveness
  - Economy/cost-effectiveness – supports affordable social benefit of rail

Niche

- ExRes is a *securing* product: its security function is subsidiary to its principal purpose as a conveyance
- As an asset to be protected in itself it is also
  - A *secured* product – protected by wider railway security procedures
  - *A secure product – resisting damage to itself*

Mechanisms

The security function of ExRes is to be realised by

1. Minimising the number of forgotten items
2. Maximising the surveillability of the carriage
3. Increasing the offender's perception of the probability of being caught
4. Preventing injuries from fragments
5. Absorbing the blast energy from explosives detonated internally
6. Strengthening the carriage structure such that it can withstand an externally generated blast and thus minimise passenger injuries

From Mechanisms to Technicality

Mechanisms	Technically realised e.g. by
1. Minimizing forgotten items	1. Minimizing storage areas
2. Maximizing surveillability of carriage	2. Removing unnecessary clutter and only including interior that does not hinder sight more than necessary
3. Increasing offender's perception of probability of being caught	3. Installing CCTV at entrances
4. Preventing injuries from fragments	4. Only including interiors that resist fragmentation and fire
5. Absorbing blast energy from explosives detonated internally	5. Ensuring rapid and sufficient ventilation of explosive gases
6. Ensuring carriage structure withstands externally generated blast and thus minimizes passenger injuries	6. Strengthening carriage walls and floors with interior detached ribs

CT bin – Security Function Statement

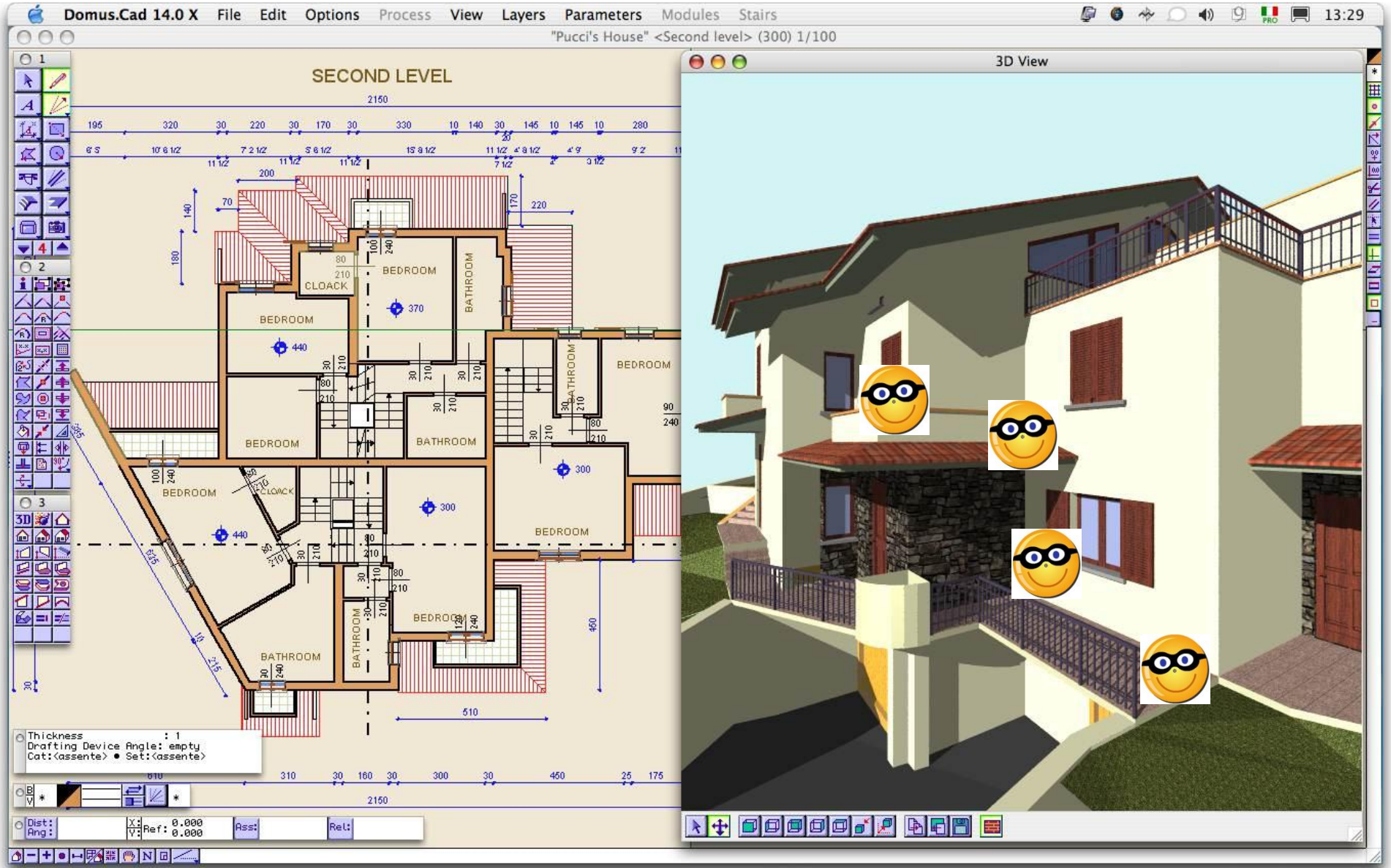
- **Purpose**
  - Principal **purpose** – a functional and serviceable trash bin for use in public spaces in railway stations
  - **Subsidiary purpose** – minimizing the misuse of the bin for the concealment and detonation of an explosive device
  - **Auxiliary purpose** facilitating verification and efficient management of security threats (including false alarms) related to trash bins.
- **Niche**
  - Primary niche – a securing product
  - Additional security niche – facilitating security management
- **Mechanism**
  - For **securing niche** – features to limit size of objects that can be placed in bin and features that facilitate monitoring and identification of objects in bin by staff and public
  - For **security management** niche - features to facilitate efficient use of robot bomb disposal and X-ray equipment
- **Technicality**
  - Small 12-cm aperture for depositing trash; bin materials and dimensions that allow visual access of bin contents, promote maintenance, and control access; and, at rear of the bin, a secure purpose-designed slot for an X-ray slide.

SFF – issues

- These 4 levels of the Security Function Framework resemble a structured **patent claim** – *Purpose served through security niche by mechanism realised by technology* – albeit patents also have diagrams
- SFF can be used not just to describe what's been done, as with the Stop Thief Chair, but prospectively, as with Ex-Res carriage; seems capable of handling significant as well as relatively minor security issues
- Can apply to all crime prevention, not just that delivered through design of products/places
- Fully set out in forthcoming book (early 2012) **Design Against Crime: Crime Proofing Everyday Objects Crime Prevention Studies 27.** Boulder, Col: Lynne Rienner

Technology of design visualisation – Helping designers, clients and users with virtual reality design aids

Computer aided design



Virtual Reality for lighting design

- Enables designers to visualise lighting before implementation
- Provides a means of communicating design ideas to different interest groups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Contact us at

Design Against Crime Research Centre

p.ekblom@csm.arts.ac.uk

www.designagainstcrime.com

www.designagainstcrime.com/web/crimeframeworks

University of the Arts London
Central Saint Martins

DESIGN AGAINST CRIME

DaC

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See also www.designagainstcrime.com , www.bikeoff.org

Importance of process knowledge – throwing away the cookbook

- Crime prevention requires practitioners to
  - Be adaptable, subtle, alert to tradeoffs – customising the response to context, and creating and configuring plausible propos for new circumstances
  - Replication is innovation
  - Handle uncertainty and lack of complete knowledge of what works
  - Anticipate & allow for change
- This needs practitioners more like expert consultants than technicians

Horizon Scanning

- **Forecasting future trends, developments and events**
- **Broad sweep of sources for issues that may impact on**
  - **Policy, Delivery, Practice and Public affairs**
- **Covers the short (2 years), medium (2-5 years) & long term (5-10+ yrs)**
- **Considers changes in Social, Technological, Economic, Environmental, Political), Organisational, Legal fields – and interactions between them**
- **Makes plausible forecasts backed by evidence, theory and logic – inexact but not wild guesses or fringe ideas**
- **Helps manage a range of risks and opportunities – 'futures thinking', not 'predicting a specific future'**

CRIME REDUCTION & COMMUNITY SAFETY

- New technology/ business models, economic changes >
- New opportunities, targets/ tools for crime – especially cybercrime;
- New opportunities for crime reduction & community safety
- False alarms/nuisance

CHANGE UNINTENDED CONSEQUENCES THREATS OPPORTUNITIES

Linking forecasts of background trends & events to CDR & CS policy, delivery, practice and performance