Risk analysis design guide

Using theory to analyse crime risks and generate design guidance for secure bike parking

October 2008

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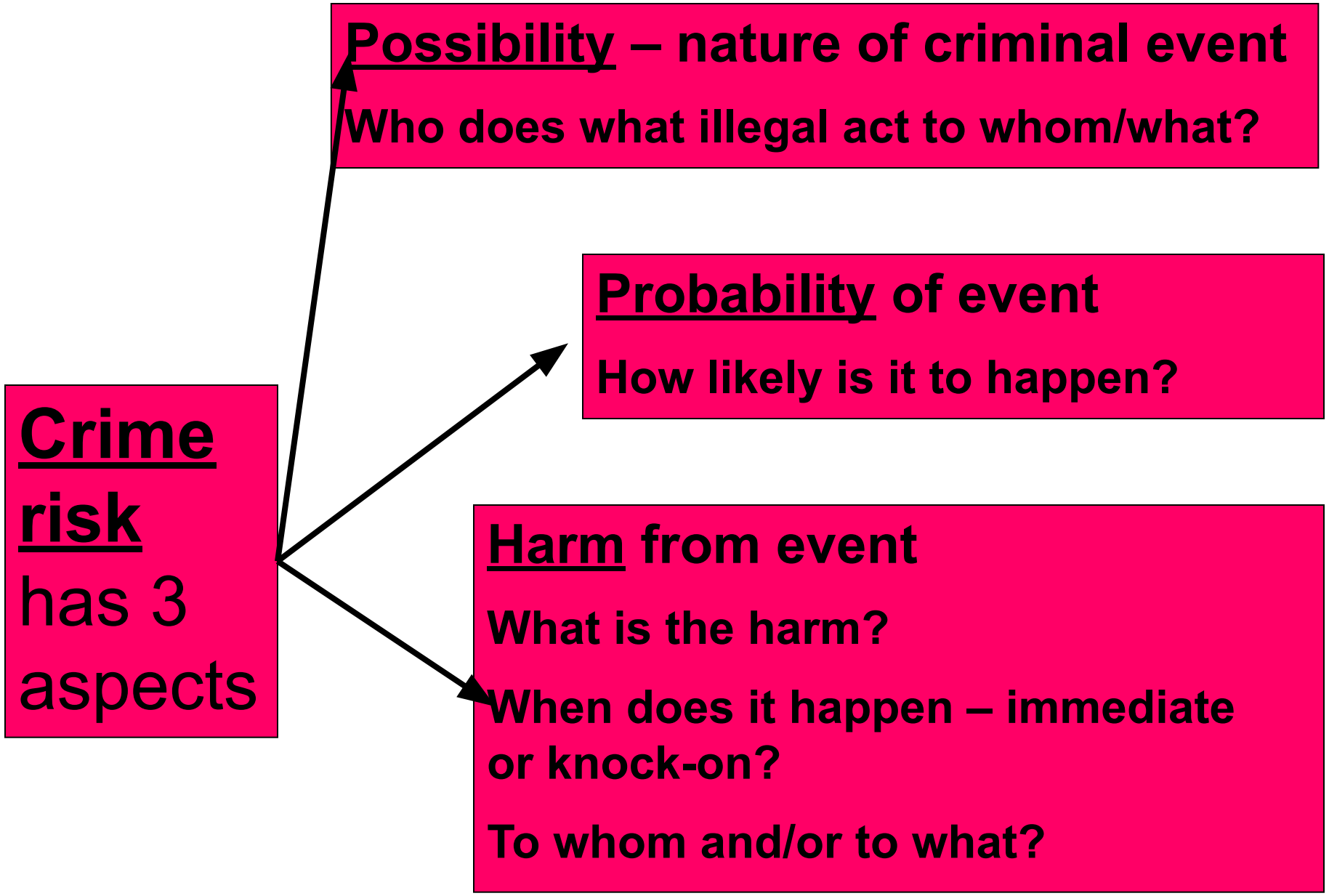
NOTE

- This presentation is a synthesis of work undertaken, for 'Bike Off 2 – Catalysing Anti Theft Bike, Bike Parking and Information Design for the 21st Century', supported by AHRC/EPSRC grant
- It aims to document, and convey, an approach to generating Design Against Crime guidance that is based on theoretical frameworks for crime prevention, available at www.designagainstcrime.com click on 'crimeframeworks'. Guidance based on these frameworks complements that produced via gleaning existing practical experience of secure bike parking design.
- The presentation builds on an earlier one, *Thinking Thief: Crime Frameworks for Design Against Crime,* also on this website.
- While the focus here is on secure bike parking, the intention has been to design an approach that is of generic utility.
- More traditional documentation is in the accompanying report *'Standard generation through application of CCO framework',* also on the bikeoff website www.bikeoff.org
- I am grateful for their inputs to Chris Campbell, Shane Johnson, Lorraine Gamman, Aiden Sidebottom, Adam Thorpe and Marcus Willcocks

What is crime risk?



Design Against Crime seeks to

Eliminate possibility of crime

or if not

Reduce probability of criminal events

or if not

Reduce or mitigate harm when they do happen - including propagation of crime

Harm information used for

Setting **priority** in design requirements

Guiding **avoidance** or **mitigation** by design

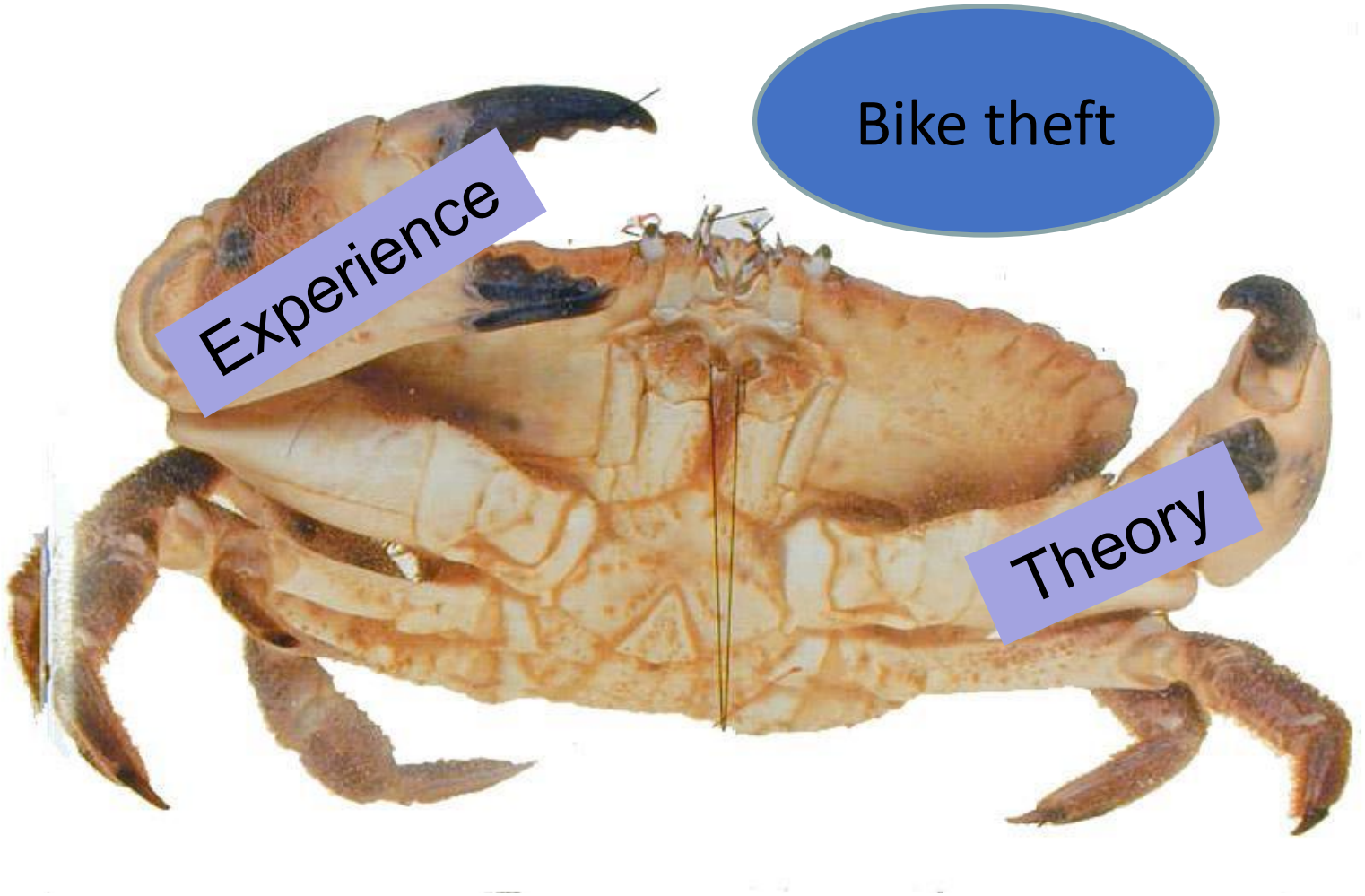
How can DAC be helped to do this?

Sources of guidance for designers

- Prior practical experience
- Research and evaluation
- Theory
- With bike parking

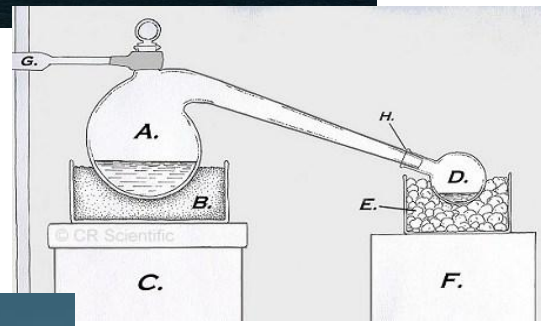
  - **Relatively little research** – see **COPS guide**
  - **Much experience – via WIKI**
  - **Available theory from crime science/ criminology**

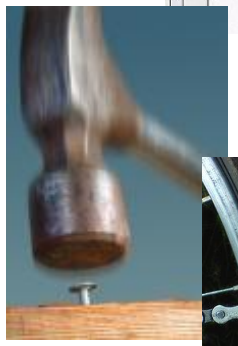
Two-pronged attack

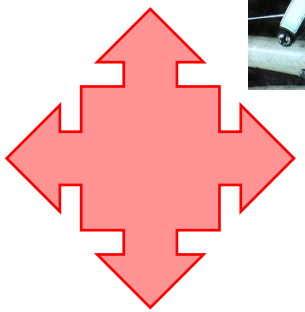


The approach via theory

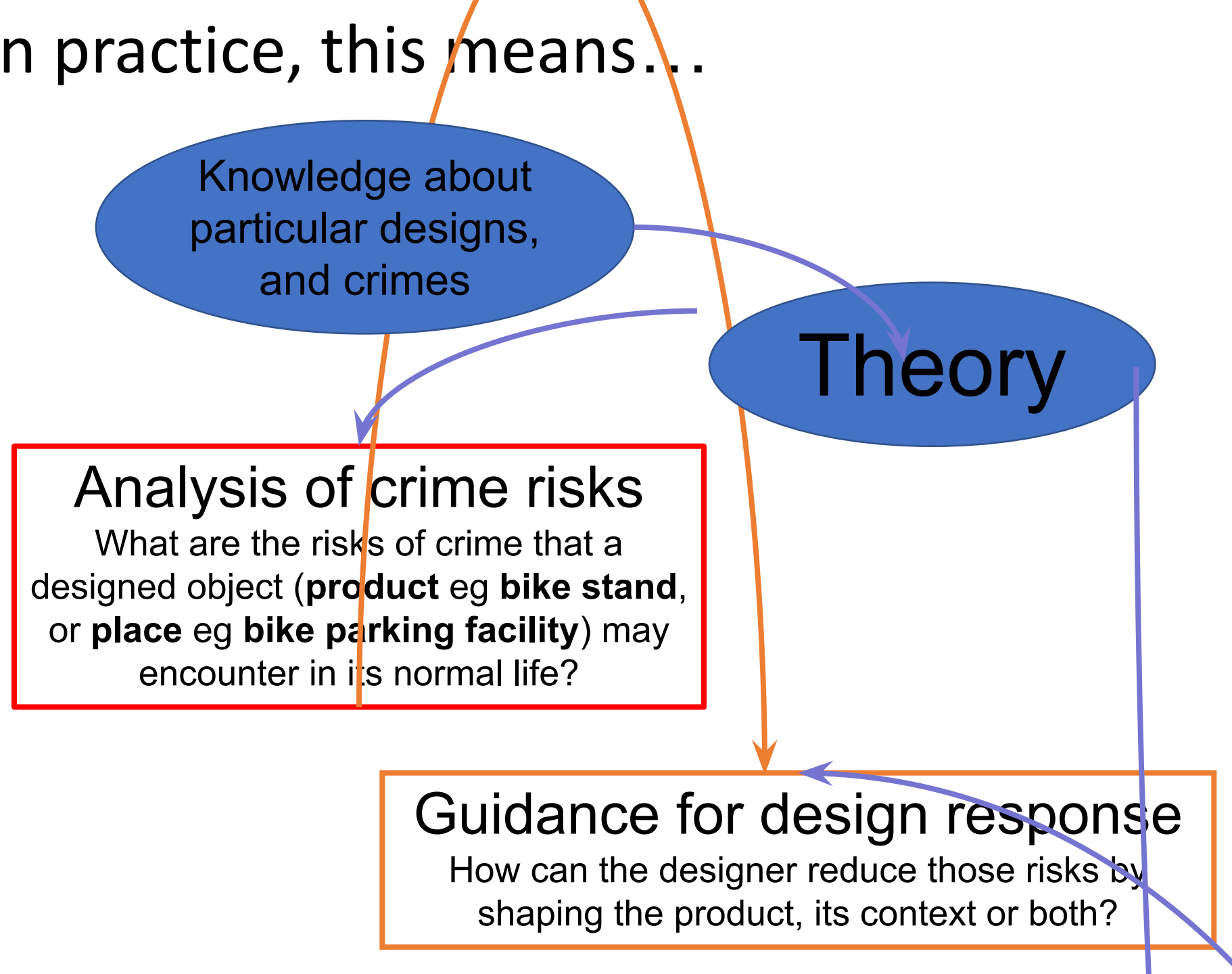
- Theory doesn't come out of blue
- Theory (as used here) is research and experience, compressed, refined and tested, and described in a rigorous and systematic way
- Theory relates to **cause & effect**
- Key concepts are
  - **Mechanism**
    - How do the causes of crime operate?
    - How does the intervention work?
  - **Context**
    - What other conditions needed to make intervention work?







In practice, this means…

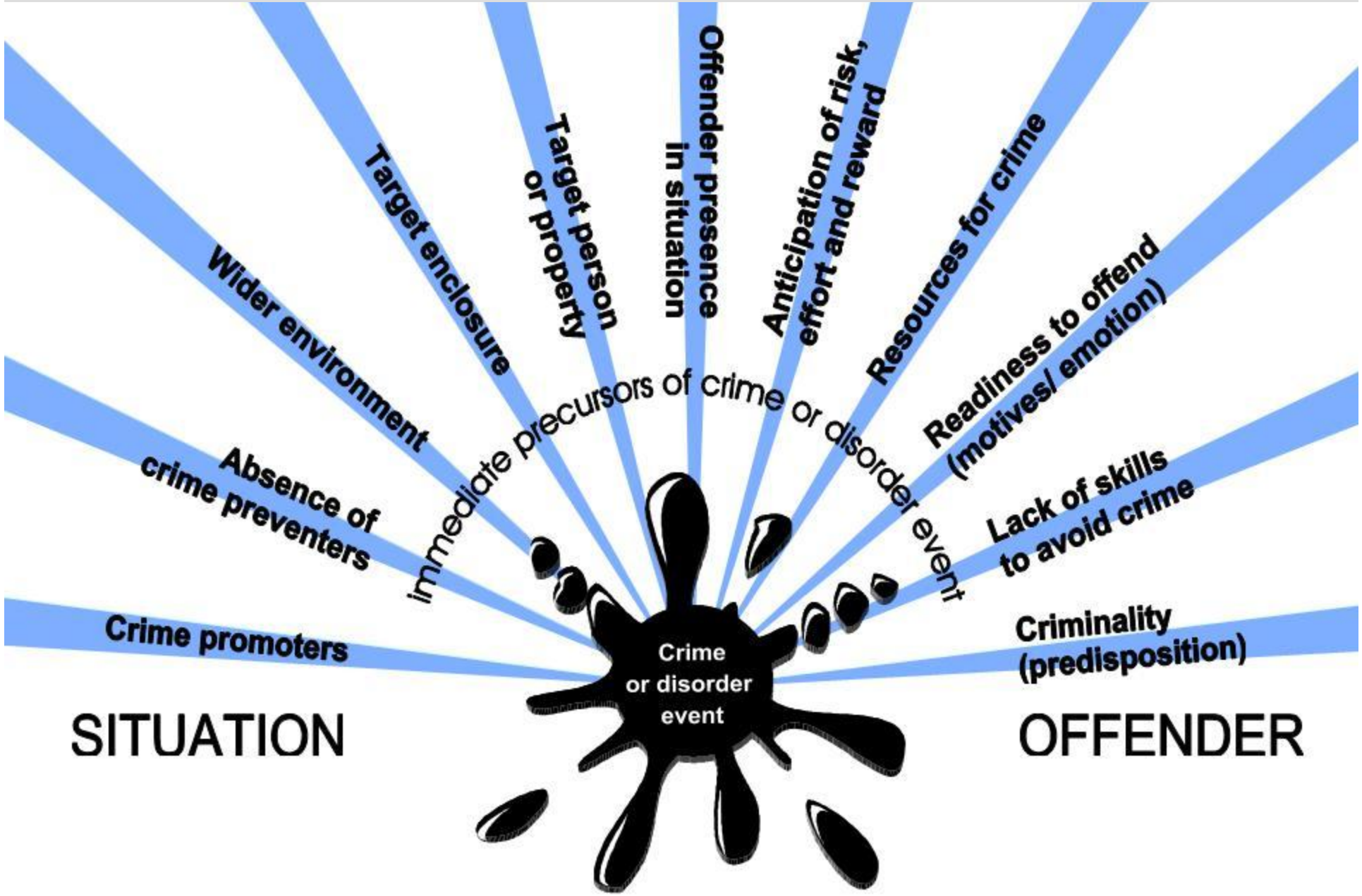


Which theory?

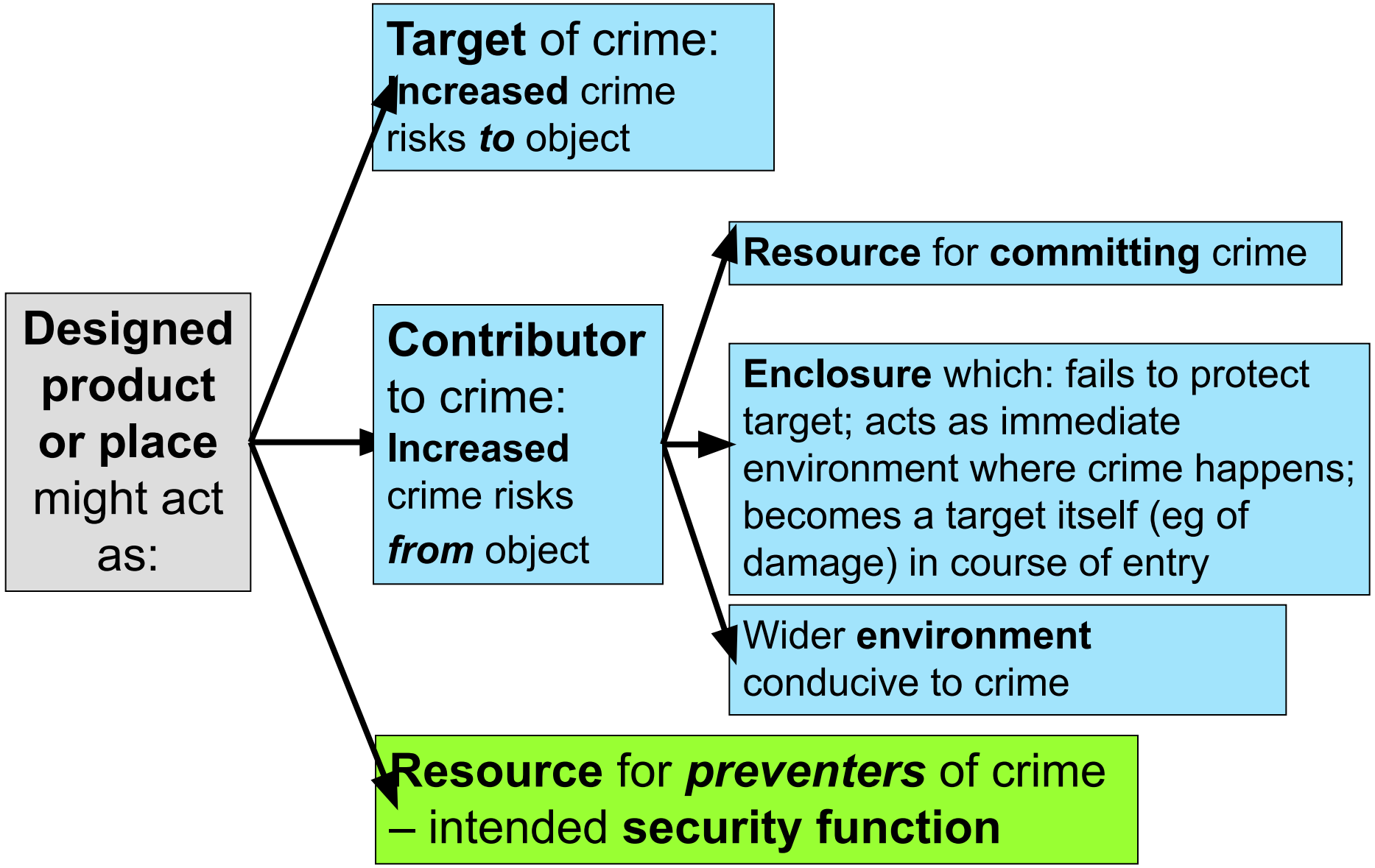
Conjunction of Criminal Opportunity

- Supports **risk analysis** by
  - Integrating diverse theories in criminology/ crime science and
  - Mapping 11 immediate **causes** of criminal events – relating to the **offender** and the **crime situation,** which includes crime **target**, **environment, enclosures** and other people in it who can **prevent** or **promote** crime
- Supports **design response** by
  - mapping 11 ways of **intervening** in those causes, including **Situational Crime Prevention principles**

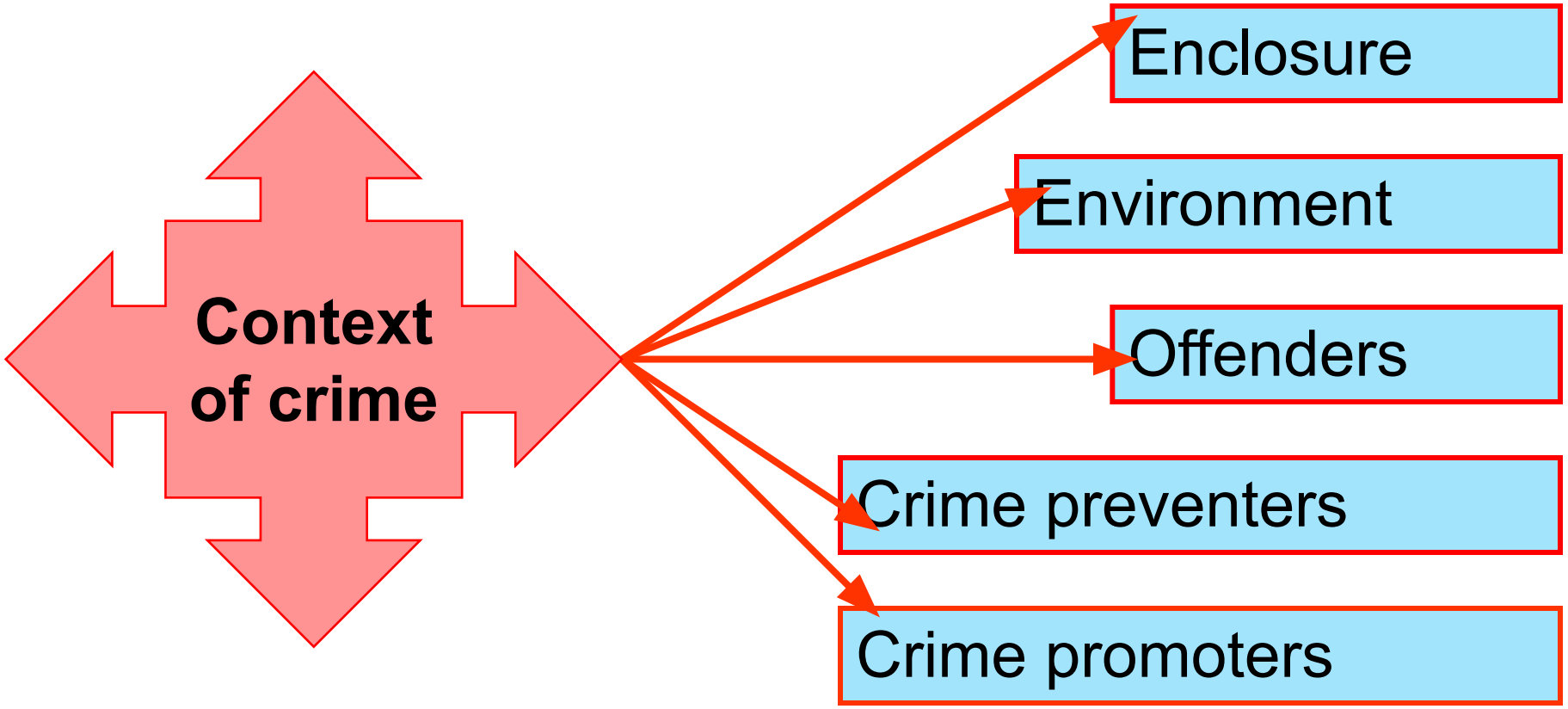
The Conjunction of Criminal Opportunity (CCO): immediate causes of criminal events, influencing their risk



Identifying **Possibility** using CCO theory



CCO also describes immediate **context** of criminal events



These are treated as **'risk & protective factors'** for crime and should be considered by designers

The designed product itself suffers crime risk in two ways

Designed product or place might act as:

Object involved in crime – eg **stand** is itself damaged, stolen etc – **self-protection**

Design whose function is to prevent crime – failure of control – eg **stand** fails to protect **bike** from theft

Here we have to think of whole system: **bike + lock + stand + user**

So the whole CCO exercise covers

	Furniture	**Facility**
As object (self-protection)	**Bike stand *alone***	**Enclosure *elements* (periphery, barrier, access, interior)**
In-function (protecting other things)	**Bike stand + bike + lock + user as *system***	**Enclosure + bike stands + bikes + users + guardians *as system***

When does a **context** become a **design**?

- In the case of the bike stand as object or in function, the environment is simply part of the **'natural' context** within which the designs operate
- With the complete bike parking facility, environment and/or enclosure are **designed** with security and other functions in mind
- In turn, the facility will be situated in its own wider environment

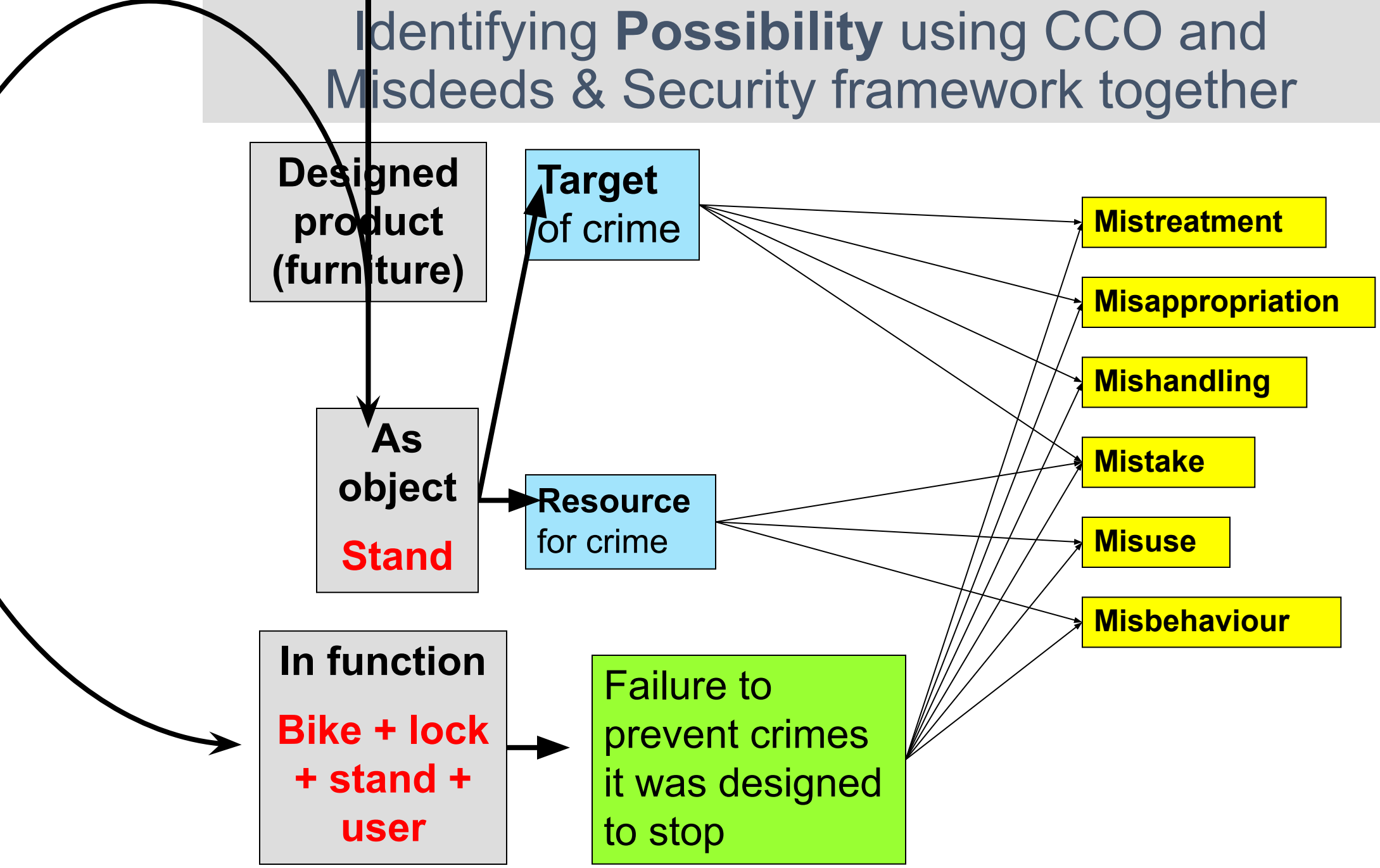
Which specific crime risks do these objects or systems face?

- CCO is very generalised – to identify risks we need to look at different crime types
- But there are **hundreds** of legal categories of crime – how to tame the variety?
- **Misdeeds & Security Theory**
- This takes the generalities of CCO and focuses them on specific kinds of crime risk and preventive intervention

Misdeeds & Security – Types of criminal behaviour

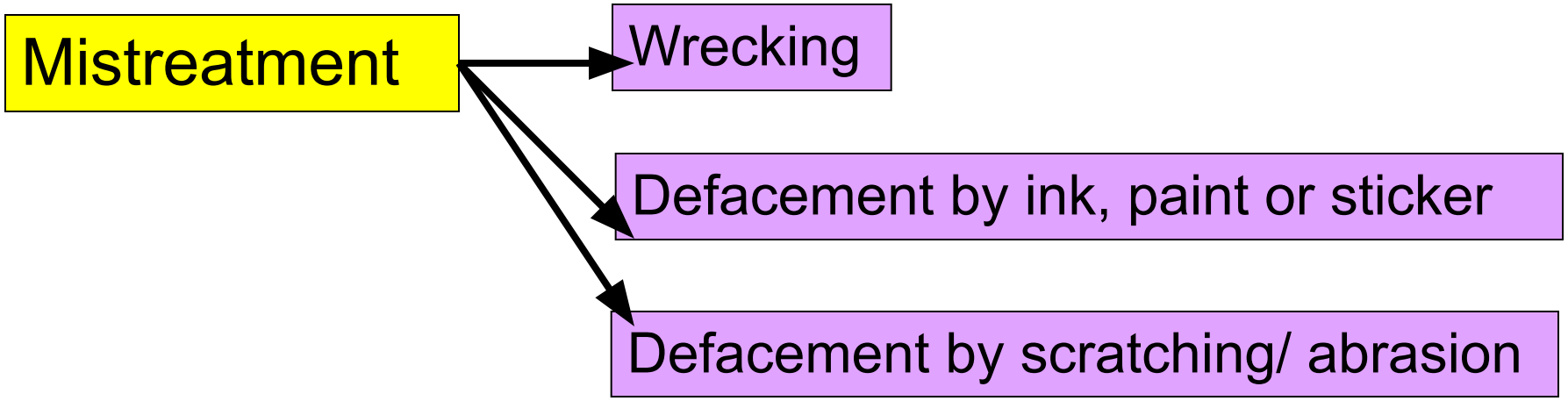
- Mistreatment (damage)
- Misappropriation (theft)
- Mishandling (eg fraud)
- Misuse (eg as tool)
- Misbehaviour (nuisance, conflict)
- Mistake (false alarm)

Identifying **Possibility** using CCO and Misdeeds & Security framework together

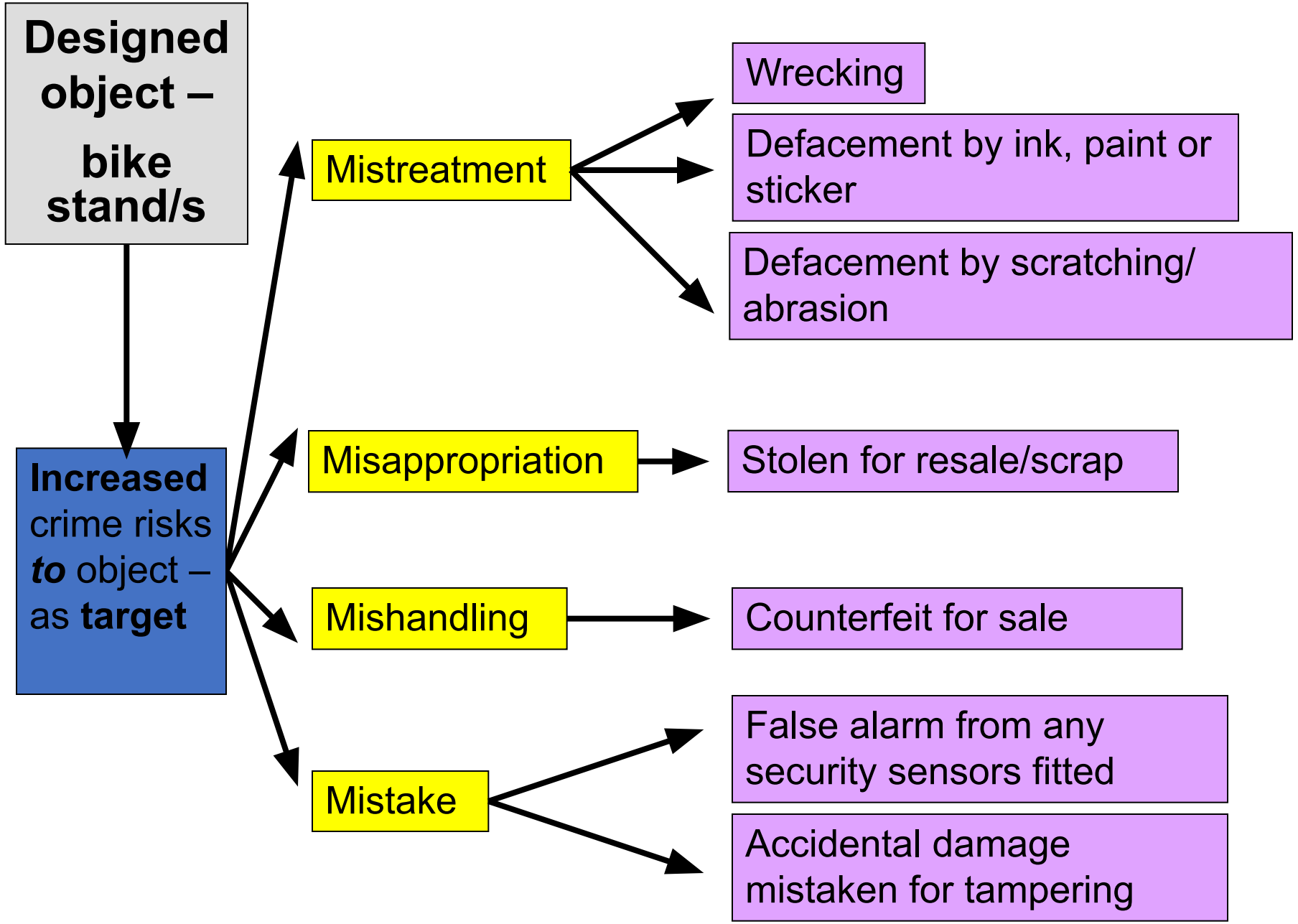


From general to specific crime risks - example

Information on specific crime type, perpetrator technique, offender etc



Crime risks *to* designed object – furniture – bike stand



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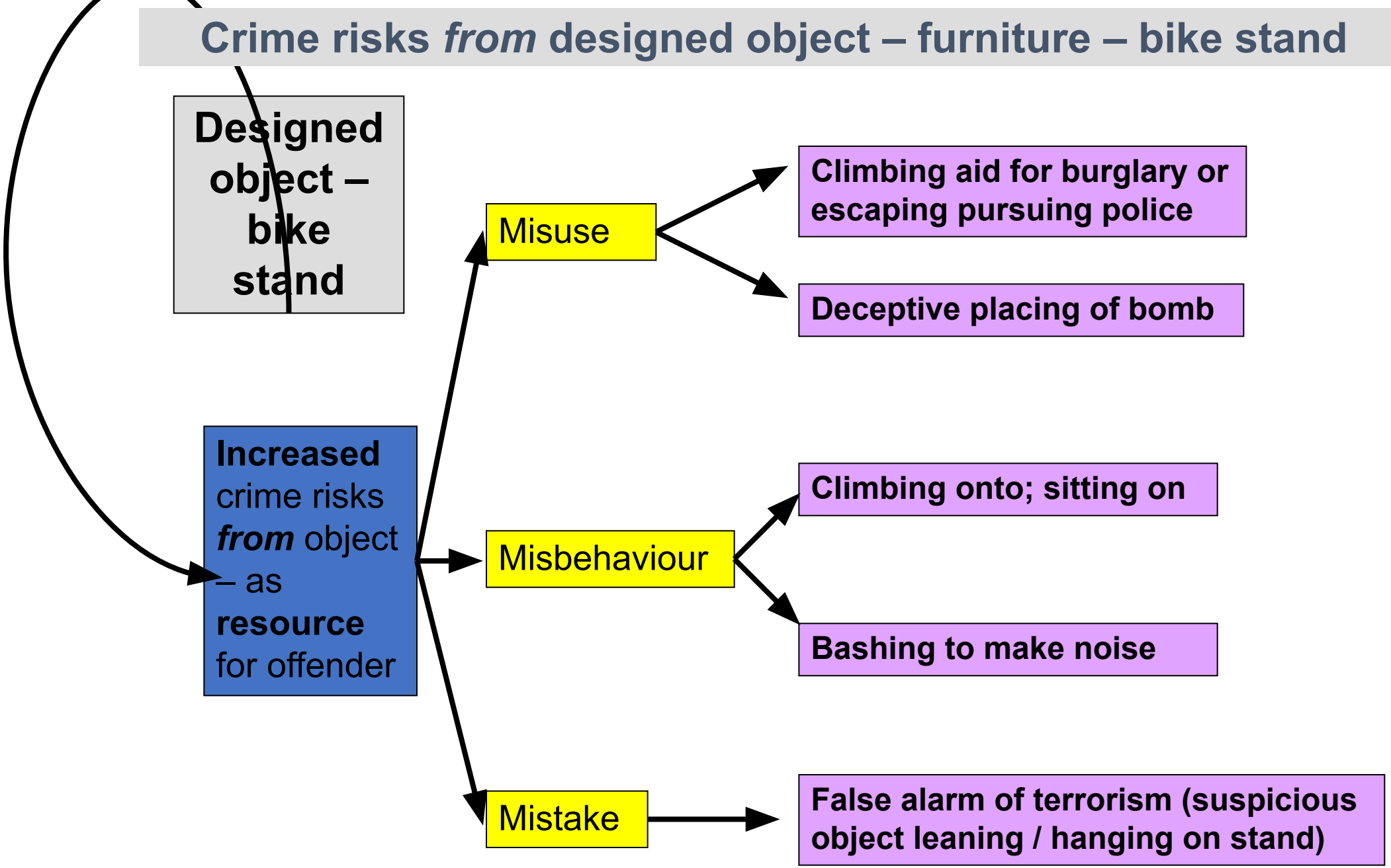
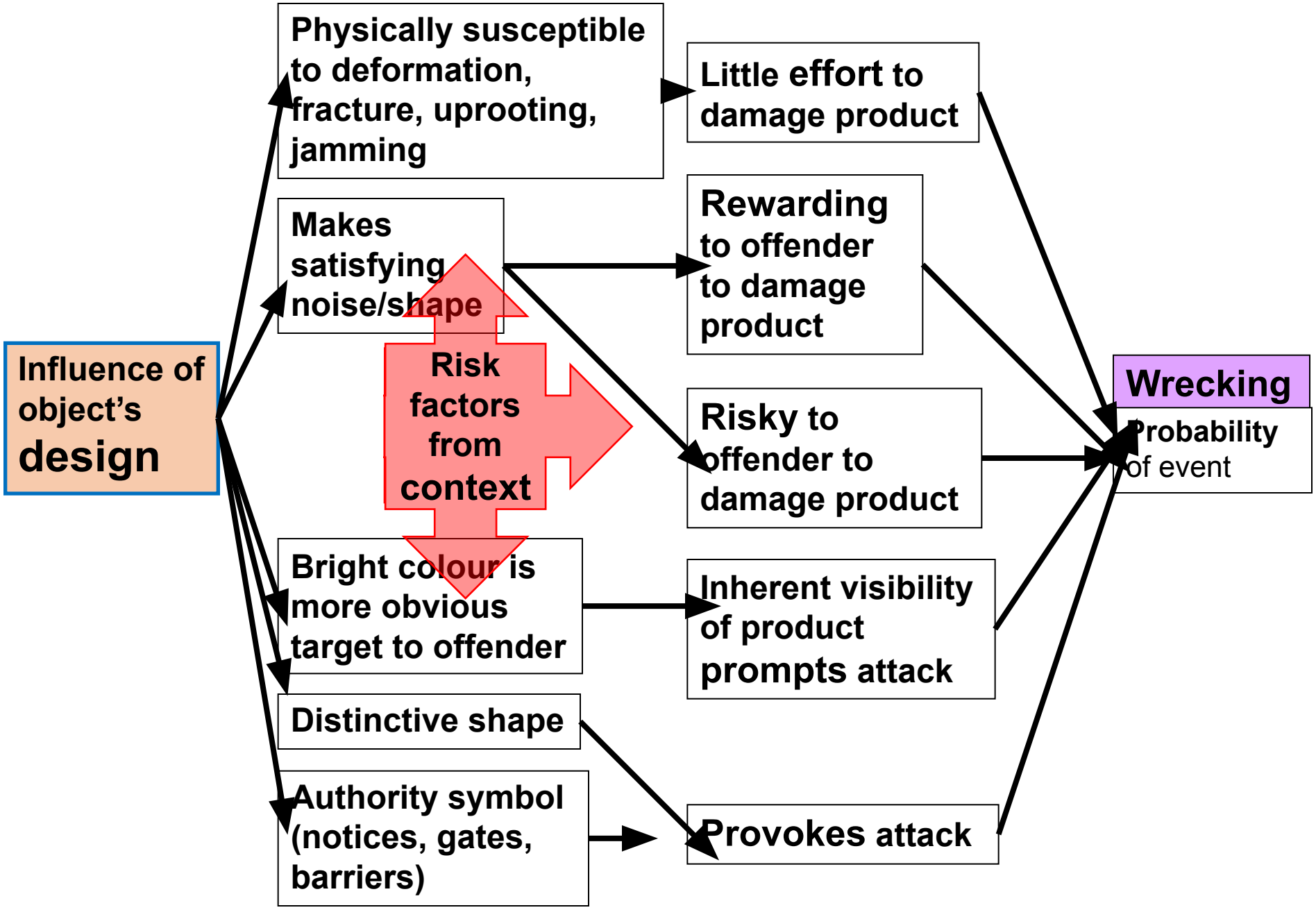
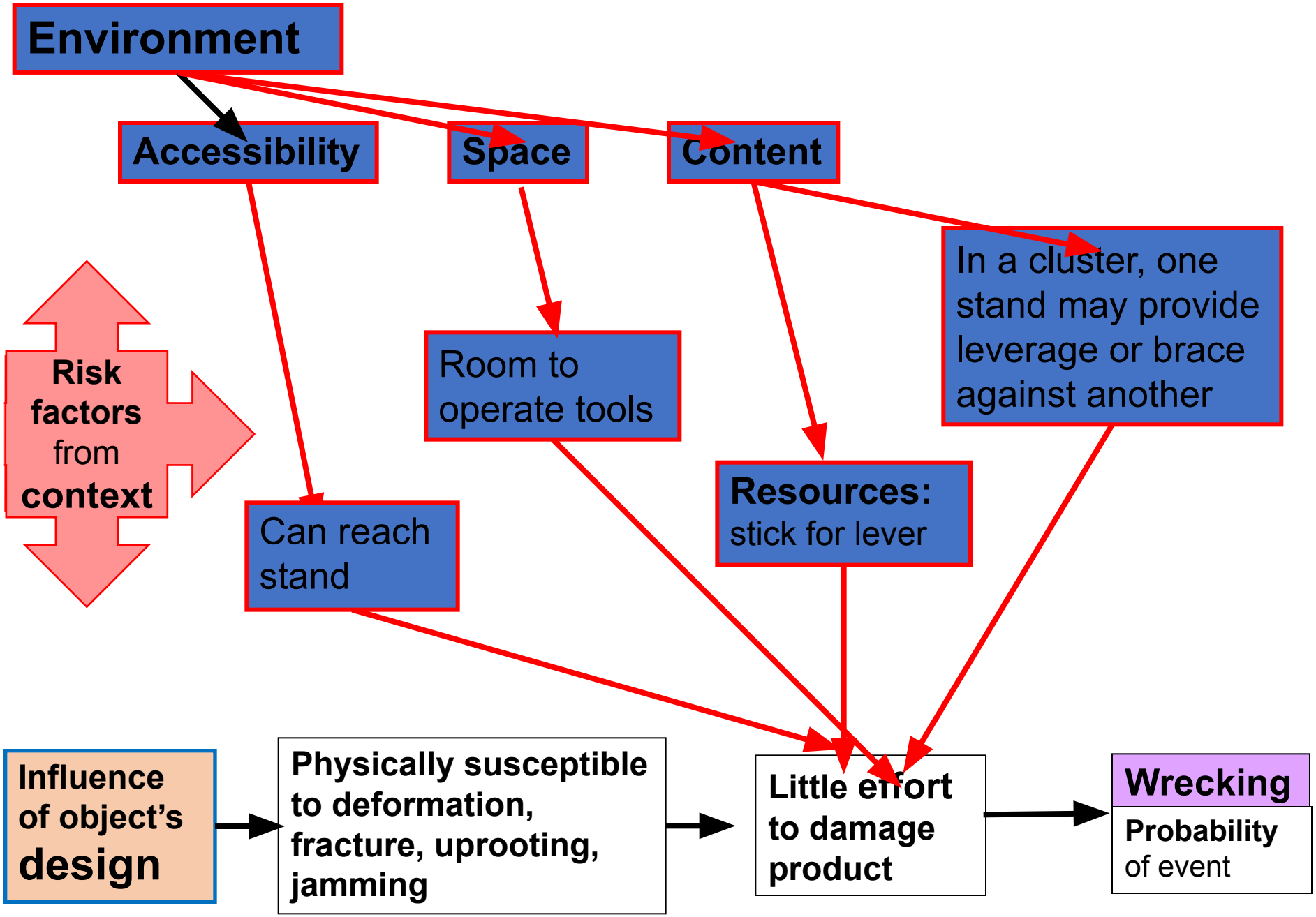


Crime risks *to* designed object – furniture – bike stand – wrecking – probability



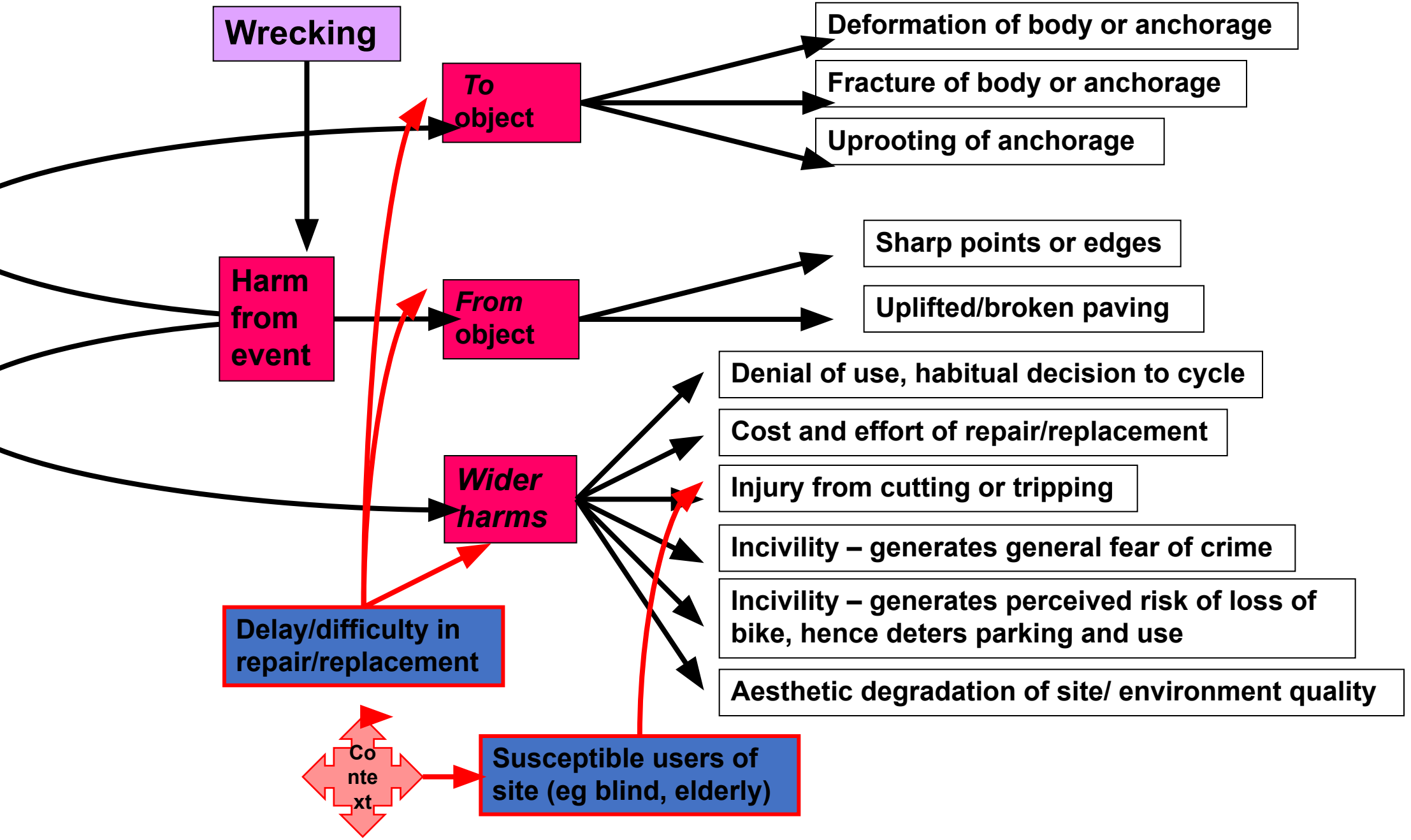
Crime risks *to* designed object – furniture – bike stand – wrecking – probability



Slide on script elements and how they interact with product and context here?

- With the Dynamic variant of the CCO framework, we can go into further detail and ask how the various stages of a particular crime script might be affected (eg seek, see, take, escape, sell).

Crime risks *from* designed object – furniture – bike stand wrecking – harm



From Risk…. to Design

Analysis of **crime risks**
(causes and risk factors)

Guidance for **design response**
(**functional** rather than technical
gives greater design freedom)

Risk analysis to design guidance: procedure

Select a **design focus** (specific product or place to be designed)

Where appropriate, **break into components** (eg enclosure > barrier, entry, interior) or **integrate into wider system** (eg bike + lock + stand)

Select orientation – **design as object** (target or resource for crime) or **design in-function** (prevent crime eg stand intended to protect bike)

Taking **design as object [need new term?]**
(include self-protection (eg resist damage)

Consider crime risks **to or from** object:

Taking **design in-function**

Specify intended **security function** of product, using Security side of M&S framework, and spelling out in **technical & mechanistic** terms

Consider risks of **failure of security function** to protect:

…in terms of **possibility** (using CCO + Misdeeds + crime specific info)

Then for each possibility, consider factors influencing the elements of risk:

* **Probability** and
* **Harm**

These factors include:

* **Design** of product
* Physical & social **context** where it is to be sited (using CCO)

For each crime possibility, state the **design recommendation intended to reduce risk**, using language that is both **functional** (crime possibility to be prevented) and **mechanistic** (how it could work in terms of **causes** of criminal events to be blocked, weakened or diverted, and likewise causes of harm from those events blocked, weakened or diverted, or harms mitigated)

(eg *prevent **damage/wrecking**, by **reducing provocation***)

Design guidance – stand as object [1]

Details of criminal events

- **Wrecking leading to deformation, fracture, uprooting; defacement by ink, spray paint, sticker; cutting, abrasion using range of brought & adventitious tools…**
- **Usually by children/young people for play or perhaps retaliation against officials/users. Perhaps user frustration with failing or awkward mechanism.**

General contextual risk factors increasing probability of crimes

- **People ready to offend due to lack of legitimate local entertainment.**
- **Offending or oppositional subculture.**
- **People likely to be drunken/rowdy; availability of alcohol.**
- **People hanging around in groups likely to pressure/permit offending.**
- **Dislike of cyclists/envy at expensive bikes.**
- **Officious notices, over-zealous guards, may provoke attack.**
- **Slow/imperfect repair/replacement may prompt further attack.**

Design guidance – stand as object [2]

Mistreatment – deliberate damage as end in itself

Wrecking

Design requirements to reduce <u>probability</u> of undesired events

- **Furniture should not stimulate deliberate damage (eg by appearing weak, provocative or being rewarding to damage eg in terms of enjoyment of exercise of force, sight, shape or sound).**
- **Any mechanism should cause minimum frustration to legitimate users, hence minimise 'machine rage' – both in operation and in failure mode (eg should clearly indicate 'out of order').**
- **Furniture and its components eg locking arms should resist deliberate damage, including by use of readily available hand tools or adventitious implements (eg stones, poles, sticks) including insertion of tools or substances into working parts. *Risk factors:* proximity to supplies of adventitious implements or bracing/leverage points.**
- **Clusters should not give leverage/bracing sites to attack adjacent stands.**
- **Consider all users of the space so non-cyclists don't get hostile to furniture.**
- **Furniture should activate surveillance by calling attention to damage in progress (eg by requirement for conspicuous movement to achieve damage; inherent mechanical noise, or electronic alarm if appropriate).**

Design guidance – stand as object [3]

Mistreatment – deliberate damage as end in itself

Wrecking

Design requirements to reduce <u>harm</u> from undesired events

- **Furniture should 'fail safe' (eg not leave harmful sharp edges, trip hazards or electrical hazards). *Risk factor*: vulnerable street users eg blind, children.**
- **It should not destroy ground anchorage in breaking.**
- **Damage should not propagate – eg rusting. *Risk factor:* exposed sites.**
- **Damage to any parked bikes should be minimised.**
- **Functional damage should be tamper-evident (so user doesn't try to park at stand eg which no longer locks properly).**
- **Visual impact on environmental quality should be minimised. *Risk factor:* if in environmentally important/salient site; or where local people fearful of crime.**
- **Visual prompting of commission of further damage should be minimised (eg contrasting undercoat exposed by scratching).**
- **Effort and cost to clean/repair/replace damage should be minimised.**
- **Down-time when unavailable for use should be minimised.**
- **Cleaning (eg paint removal) should not degrade furniture (eg affect appearance, water resistance) *Risk factor:* furniture sited in wet location.**

Design Guidance – stand in function – statement of function

- **Secures bike & components (eg wheels) against theft by anchoring to environment, and supporting a discriminator function (captive or user's lock)**
- **May secure components of bike against theft by enclosing in lockable container or by wrapping main stand around them, denying access until whole bike legitimately removed via operation of discriminator.**
- **May shelter environments and pedestrian/cycle users in vicinity of stand against nuisance and conflict by keeping bikes out of way of pedestrian paths.**
- **May shelter cycle users and other people near stand, against nuisance and conflict by rationing of parking places & by regulating movement of bikes.**
- **May enable secure acquisition of revenue from parking facilities by taking/storing cash or transacting card payment for locking & release of bike.**
- **May enable the secure operation of bike rental schemes.**
- **May safeguard environment and all users against terrorist bombs by directing bike parking to less harmful locations (eg out of the immediate way of crowds), or by mitigating harm directly through design (eg by deflecting blast).**
- **Self-protection against criminal countermoves for disabling security function and misuse in furtherance of other crimes – partly under furniture as object.**

Design Guidance – furniture in function – prevention of failure of security function [1]

Misappropriation

Theft of bike by unbolting, cutting, lifting, loosening stand

Design requirements to reduce <u>probability</u> of security failure events

- **Fixings, foundation & anchorage should resist detachment/ working loose.**
- **Stand should resist cutting/bending, where this would allow removal of bike.**
- **Stand & anchorage should *appear* robust against these actions, discouraging offenders from even trying and thus causing damage even in failed attempts.**
- **Any detachment/cutting should be tamper-evident to users and/or guards/managers. Consider communications to alert, inform & empower users.**
- **Maintenance/repair of anchorage should be easy to inspect and undertake.**
- **Actions to detach or cut stand (unbolting, working loose or cutting) should be obvious in sound, sight of movement, and if possible, intent.**
- **Unbolting etc should require specialist tools and should be difficult with likely hand tools brought by offenders or acquired adventitiously nearby.**
- **Subject to requirement for legitimate use, and maintenance/ replacement, access & space to undertake detachment/cutting action should be constrained.**
- **If stand detached from anchorage, bike + lock should not be easily removable (eg by sliding off free end) from loose remains of stand, but should stay attached as encumbrance (discouragement through increased effort to complete the separation) and deterrent (offender's perceived risk of detection).**

Design Guidance – furniture in function – prevention of failure of security function [2]

Misappropriation

Theft of bike by unbolting, cutting, lifting, loosening stand

Design requirements to reduce harm from undesired events

- **Consider 'fuse' arrangement so removal of bike leaves anchorage intact – but avoid thereby making crime easier.**
- **Minimise risk of injury from loosened stand falling on someone, or cut edges cutting, spiking or tripping them.**
- **Minimise damage to neighbouring parked bikes during theft.**

Next steps: putting the sources of guidance together