

Standard generation through application of CCO framework

Final report WPA2 of 'Bike Off 2 – Catalysing Anti Theft Bike, Bike Parking and Information Design for the 21st Century'.

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Overview

This is the report on one of the Work Packages of the Bikeoff 2 project, funded by AHRC/EPSRC Design for the 21st Century. WPA2 is about 'Standard generation through application of CCO framework'. The standards in question apply to secure bicycle parking facilities. CCO – the Conjunction of Criminal Opportunity¹ – is a conceptual framework for providing a unified theoretical map of immediate causes of criminal events, and an equivalent map of preventive interventions intended to block, weaken or divert those causes. The interventions can be created and implemented through products, places and communications which are deliberately designed to influence the causes of crime. In the present case the events and the interventions relate to bicycle parking, but the framework is generic.

The output of WPA2 is intended to complement guidance obtained from a compilation of existing secure cycle parking experience, under WPA1, as modified by public contributions from a user Wiki. In fact, the wider aim, of which WPA2 is a preparation, is to compare design recommendations obtained from the two sources, the one theoretical, the other experiential. More details are in the Introduction, below. The relevant section of the project application (April 2006) states:

This project aims to generate a 'Secured By Design' standard for bicycle parking and in so doing test Ekblom's model of the 'Conjunction of Criminal Opportunity' as an appropriate framework for standard generation. To deliver this research the work

¹ Ekblom (2000), and see www.designagainstcrime.com/web/crimeframeworks .

packages will identify and generate standards, using different methodologies, in order to evaluate the efficacy of the standards, and the 'fitness for task' of the methodologies that generated them. The standards we generate will be combined to provide a definitive 'Secured By Design' standard for cycle parking. The definitive standard will be evaluated and 'evolved' by potential users, such as engineers, designers, cycle parking specifiers and providers and cyclists (users of that the facilities the standard seek to inform).

The present report describes the process of adapting the CCO framework – quite significantly as it transpired – to fit in with the demands of the design process (and designers' ways of thinking). The purpose of the adapted framework was twofold: first, to develop a systematic method of **crime risk analysis** that was suited to the design field; and second, to translate the identified risks into the **design recommendations** which constitute the output of this work package.

Part 1 introduces the approach to crime prevention evolving within the Design Against Crime Research Centre at Central Saint Martin's College of Art & Design, University of the Arts, London; and in particular, how this approach involves activity at a number of different levels, from preventive operations aimed at tackling crime at specific sites to developing innovative capacity to transfer to designers. It then describes the Bikeoff project within this context, sets the scene for the current Work Package, discusses the concept of standards and guidelines, and reviews sources of knowledge for developing designers' capacity, including CCO (as a 'digest' of theory) and experience (as from reviews of existing designs).

Part 2 sets out the CCO approach to crime prevention and design as it was at the start of the current project – CCO Classic. It first shows how CCO originated as a means of unifying crime prevention theories and classifying diverse practice, and ended up as a dual conceptual framework for mapping out the immediate causes of criminal events and the corresponding intervention principles that serve to prevent them. Key ideas are introduced covering Situational Crime Prevention, causal mechanisms (how crimes happen and how interventions work) and the importance of context. This is followed by an account of how in principle CCO can guide Design Against Crime and why it seems well-suited to the task; and how it came to be used, and tested, in the Bikeoff project.

That process of bringing a theoretical criminological framework together with design and designers in fact caused CCO to evolve in several significant ways, documented next. These modifications included combining CCO with additional concepts such as crime 'scripts' and moving from the consideration of crime in general to that of different **kinds** of crime risk, handled by the Misdeeds & Security framework. (These developments have more general implications for some of the traditional tenets and assumptions of Situational Crime Prevention.) To distinguish this new version from CCO Classic, this became known as CCO Dynamic. During the development process it also became clear that the scope of the Work Package, originally aimed at producing CCO **standards**, in fact would only meaningfully deliver CCO-based **guidance**.

Part 3 describes how CCO Dynamic was applied to the task of generating guidance for securing bike parking furniture and facilities. It covers the **overall procedure** for generating design guidance using CCO Dynamic; the development of the underlying framework for **analysing the risks**; the development of the framework for the response to that risk, namely for **design guidance**; and finally the complete prescriptive design guidance **output**.

Part 4 supplies a brief conclusion. How CCO performed in generating guidance for bike parking security, in comparison with the designers' experience (so-called 'Best of Breed compilation'), is reported in a subsequent document (WP4).

At this point it should be stated what this document is, and is not. It *is* an account of a developmental process based on the interaction of design and crime science (Smith and Tilley 2005), which evolved as it unfolded and iterated, leading to these intellectual products:

- a) **Crime risk analysis** for bike parking furniture and facilities, with emphasis on design and contextual issues
- b) Based on that analysis, **design guidance** on functional considerations for secure bike parking furniture and facilities
- c) **Procedures** for undertaking the two analyses
- d) A **conceptual framework** to support those procedures and generate those intellectual products

Production of the design guidance is sufficient for the present purpose of 'bench-testing' the CCO framework (as it has evolved during this project) as a source of ideas to stimulate and shape design; and for subsequent comparison with guidance based on practitioner experience. Although the design subject in this project – secure bicycle parking – is a narrow one, the intention has always been to ensure the framework and procedures are generic enough to be adapted to tackle any kind of crime and its prevention through design.

However, the document, and more particularly the intellectual products it contains, are *not* in the form of user-friendly embodiments of the frameworks, the procedures or the specific design advice. Although various moves are made in this direction as the opportunity has arisen, the framework and procedures in their current state should be regarded as prototypes on a test rig, rather than anything that can immediately be handed over to developers of design guidance and standards, or users of same. Converting them into usable applications would require a separate project involving further conceptual tidying-up, graphic design and development and testing of interactive IT-based guidance.

A slide presentation summarising this report, *Risk analysis design guide: Using theory to analyse crime risks and generate design guidance for secure bike parking* is available on www.bikeoff.org

as is an earlier one establishing some of the theory, *Thinking Thief: Crime Frameworks for Design Against Crime*.

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1. Introduction

The Design Against Crime Research Centre (DACRC) at University of the Arts London aims to use the processes and products of design to reduce all kinds of crime and promote community safety whilst improving quality of life.² The reduction is to be achieved by *crime prevention*, which can be defined as ‘intervening in the causes of criminal events to reduce their risk, whether the probability of their occurrence or their harmful consequences.’³ Some of those causes and consequences reside in, or act through, the design of products, places and systems; design, too, can contribute to their prevention, alleviation and mitigation.

Developing, building and applying the capacity for design against crime

DACRC aims to connect to the practice of **designers**, and to the world of ‘ordinary’ crime prevention practitioners and other **users of design**, on several levels. These range from the most local and tangible to the most generic and globally applicable.

- **Operational crime prevention** involves undertaking specific crime preventive projects ourselves or alongside partners, for example to reduce bike theft in Brighton & Hove.
- **Building operational capacity among crime prevention practitioners** involves manufacturing, marketing, or otherwise making available, our anti-crime products (such as bike stands), or anti-crime communication designs (such as stickers advising on secure bike parking practice), so crime prevention practitioners and designers can use them to tackle crime in their own localities.
- **Developing operational capacity** involves using our own design capacity and knowledge of crime and its prevention, to create marketable products with secure functionality which can then be made available to practitioners for operational use as described above.
- **Building innovative capacity among designers** involves spreading our researched knowledge, conceptual/theoretical frameworks and design-process models, to designers so they in turn can develop and build operational capacity to supply to crime prevention practitioners. (There is also a subsidiary aim to develop the design mindset and innovation skills of ordinary operational crime prevention practitioners themselves, so they are not merely at the receiving end of others’ ideas and products.) Key to this area of our work are the ‘design resources’ intended to transfer our research knowledge to designers to inform, empower and motivate them, to undertake DAC themselves.

² www.designagainstcrime.com

³ www.designagainstcrime.com/index.php?q=node/37

- **Developing innovative capacity** Before this innovative capacity can be transferred, of course, it has to be created. This involves locating, interpreting and presenting requisite knowledge of crime and its prevention, and creating or improving conceptual and theoretical frameworks and process models to support innovation in reducing crime.

The Bikeoff project as a whole is about **developing and building innovative and operational capacity**. It comprises three work packages.

- WP A covers the development of design standards and methodologies, hence is centred on the domain of developing operational and innovative capacity.
- WP B focuses on the development of a design resource for education, so its emphasis is on building these capacities among professional designers and crime prevention practitioners using design processes and products.
- WP C involves evolution of the bikeoff.org website both for building operational and innovative capacity through dissemination; and for getting ongoing feedback and new experience from bike users, designers and other stakeholders, which can contribute to continual *redevelopment* of capacity. All this is (to be) accomplished by facilitating user evaluation of design standards, and to provide geographic locational data for bike users linked to bicycle security in addition to a database and search facilities providing access to qualitative user experience and evaluation.

Capacity for DAC can be transferred to designers (and crime prevention practitioners who use the fruits of design) in several ways. Two such ways are standards and guidelines. **Standards** tend to be closely-specified requirements and may be **technical or constructional** ('materials should be manganese steel...') or **performance**-based ('the bicycle lock should be capable of resisting picking for 5 minutes'). Performance standards could be explicitly 'future-proofed' (eg by adding '...by currently available hand tools' – see Ekblom 2005a). **Guidelines** are less specific than standards and do not contain quantitative or qualitative benchmarks – rather, they draw attention to particular issues and considerations and may suggest ways of addressing them (for example 'the bicycle lock should resist removal by picking or forcing').

Performance standards offer greater design freedom than technical standards; guidelines even more. Tight specification can be important – particularly when based on research evidence of what works, that is fairly narrow.⁴ But design freedom is equally vital for those designers willing and able to embrace it because crime, the requirements and priorities of users to prevent it, and what preventive methods are effective, all change from context to context, and over time. This is not least because of social and technological change and adaptive offenders who can be relied on to make countermoves – so that what works now, may not always do so in future (Ekblom

⁴ Knowledge of 'what works' is not always narrow, however. Eck (2004) argues that the evidence base in situational crime prevention is best considered in terms of generic principles (the full quote is on p91 of this report). Ekblom (2002, 2007a), and Tilley (1993) argue along similar lines.

1997, 1999, 2005a). The importance of developing, building and operationally applying innovative capacity for crime prevention rests on the perpetual need for preventers to out-innovate offenders.

Sources of knowledge for capacity development

There are (at least) four sources of knowledge for developing operational and innovative capacity for prevention of bicycle crime through design standards: formalised past experience, current user experience, empirical research (both conventional academic and practice-led) and theory. Given that there is only a limited body of formal research evidence specifically on what works in reducing cycle crime (summarised in COPS bikes guide– Johnson et al. 2008), that leaves three complementary sources to contribute to the development of design standards and methodologies under WP A. The ‘Best of Breed’ approach (WP A1) has sought to glean, and combine, the widest possible range of past experience from existing standards and guidelines for bike parking. The current approach (WP A2) is a parallel, alternative exercise based initially around a theoretical conceptual framework for understanding both the **causes of crime and the corresponding interventions of crime prevention** – the **Conjunction of Criminal Opportunity (CCO)**. User consultation (WP A3) follows this current stage of work, and the final stage (WP A4) compares and synthesises all sources possibly contributing to a final standard under the UK Secured By Design scheme.

In the course of this sequence, one objective is to test out CCO as an appropriate framework for standard generation. Can a theoretical framework derived from experience and research in generic crime prevention, albeit one that was designed to be comprehensive and complex, generate as rich and inclusive a range of security considerations as a worldwide trawl of the fruits of designers’ experience? (Research that was practitioner-oriented academic research as opposed to practice-led?) Can it identify and fill gaps in the knowledge supplied by experience? Can it produce outputs which are in a form suitable to sit alongside those of existing design requirements and prescriptions? What other knowledge inputs, and reformatting of outputs, are needed to make the framework useful?

2. The CCO approach to crime prevention and design

The starting point: CCO-Classic

Design Against Crime sits largely within the approach known as Situational Crime Prevention (SCP),⁵ which takes offenders' criminal motivation and propensity as given and seeks instead to reduce the likelihood of criminal events by altering the immediate situation criminals find themselves in. A major theoretical and practical focus⁶ is on influencing how criminals experience the situation, in terms of **risk** of harm (getting shamed, beaten up or arrested and punished), **effort** and **reward**, and consequently how they make a broadly rational choice whether or not to commit this crime here and now. A second focus⁷ is on how offenders encounter crime targets in the absence of 'capable guardians' in their everyday **routine activities** or deliberate foraging. A third⁸ is how the **environment** helps to support such routine or deliberate encounters in spatial terms, predicting why crime and disorder should cluster in some places and not others on the basis of offenders' routine activities and mobility, how these influence the places they frequent and consequently their awareness of opportunities for crime and their availability to exploit them. A fourth is a lesser-known or appreciated offshoot of situational prevention, known as crime **precipitation**.⁹ Here, the situation is seen not just as providing opportunity, but awakening or channelling attention, motivation and emotion: provoking, prompting, pressuring and permitting the offender who then if suitably motivated takes advantage of the available opportunity as previously described.

The Conjunction of Criminal Opportunity was an attempt, starting in 1994, to bring these situational theories, and other theories on the offender side, into a single, consistent framework. The aim was to have a unitary language and a dual map of a) the **causes of criminal events** as these operate in the immediate crime situation; and b) **interventions in those causes** stated in terms of the principles underlying all methods of crime prevention. CCO pays more attention to **offenders** than does SCP, both because it attempts wider coverage of prevention as a whole, and because it was felt a better understanding of offender **capability, motivation and emotion** would lead to better situational prevention. CCO also distinguishes between a generalised **environment** of crime and a specific **enclosure** surrounding the target, such as a building or a wall; and introduces not just people in **crime preventer roles** (a wider concept than guardians – people who by their action or presence make crime *less* likely) but others acting as **crime promoters** –

⁵ Eg Clarke (1997), Ekblom (1998) and see also www.popcenter.org/library/reading/?p=2

⁶ Rational Choice Theory – Cornish and Clarke (1986).

⁷ Routine Activities Theory – Cohen and Felson (1979).

⁸ Environmental criminology – pattern theory – Brantingham and Brantingham (2008).

⁹ Precipitation – Wortley (2001).

people who by their action or inaction, deliberately, carelessly or accidentally make crime *more* likely. Examples of promoters could be the careless householder who fails to shut the window on leaving for work; the youth who eggs his mate on to damage street furniture; or the fence of stolen goods. Included among the offender-based causes are **resources** to avoid crime (such as ability to control temper or hold down a rewarding legitimate job) and to commit crime (tools, weapons, physical and social skills such as ability to parry a ‘what are you doing here?’ challenge, and emotional factors such as courage and control of guilt).¹⁰ The concept of resources in fact requires a modification of the SCP concept of opportunity. Traditionally seen as something ‘out there’ that the offender seizes, the opportunity is as much determined by the offender’s capacity to spot it and to safely and rewardingly exploit it. An open window three floors up is only an opportunity to someone with courage, agility and maybe a ladder.

CCO sets out in total 11 generic immediate causes of criminal events (whether these arise from the situation or what the offender brings to the situation from their immediate mood or needs, their upbringing, their culture or even their genes); and 11 equivalent families of intervention seeking to tackle those causes.

In one sentence, the **causal** side of CCO sees a **criminal event** as happening when an **offender** who is predisposed, ready and capable, encounters, seeks or engineers a **situation** in which there are: a vulnerable and attractive or provocative target; absent crime preventers and perhaps present promoters; an environment which tactically favours and/or motivates offenders more than preventers; and if any enclosure such as a building is present, one which offers inadequate protection.

The **preventive** side of CCO is simply a matter of blocking, weakening or diverting one or more of these 11 causal factors so that the set of necessary conditions for a criminal event to happen are no longer complete. This reduces the probability of criminal events happening (total elimination is unlikely), and any consequent harm. Essentially, the **causes** of criminal events are recast (in terms of discourse) as **generic, functional intervention principles**.

The 11 causal elements and their preventive counterparts are set out in Table 1 and illustrated in Figures 1-3.

¹⁰ See Ekblom and Tilley (1999).

**Table 1 Causes of, and interventions in, criminal and disorderly events:
the Conjunction of Criminal Opportunity**

Immediate causes of criminal event	Possible interventions in cause
<p>1. Criminality (predisposition to offend)</p> <p>Longer-term psychological features of offender including</p> <ul style="list-style-type: none"> ● Aggression ● Antisocial attitudes ● Criminal self-image or reputation ● Habits or standing decisions ● Drug addiction 	<p>Reducing criminality through:</p> <ul style="list-style-type: none"> ● Early /developmental intervention - tackling <u>risk and protective factors</u> ● Remedial intervention (convicted/ cautioned/ at risk young people) <p>At various ecological levels especially</p> <ul style="list-style-type: none"> ● Family ● Schools ● Friends ● Treatment in prisons, probation and medicine relating to prevention of <u>recidivism</u>

Immediate causes of criminal event	Possible interventions in cause
<p>2. Lack of resources to avoid crime</p> <p>Social and intellectual skills to</p> <ul style="list-style-type: none"> ● Avoid conflicts ● Exercise self-control ● De-escalate fights ● Earn a legitimate living and achieve esteem and social inclusion <p>3. Readiness to offend</p> <p>Short-term influences on people's mood or motivation</p> <ul style="list-style-type: none"> ● Current life circumstances including unemployment or homelessness ● Needing risk, excitement, esteem ● Recent events such as a domestic argument ● Being in a particular emotional state such as anger ● Being disinhibited through alcohol or drugs 	<p>Supplying skills to avoid crime:</p> <ul style="list-style-type: none"> ● Training offenders in social skills ● Training in practical/ work skills ● Contacts with preventers - mentors, minders and models <p>Reducing readiness to offend</p> <ul style="list-style-type: none"> ● Control of disinhibitors eg alcohol ● Control of stressors/ motivators <ul style="list-style-type: none"> ● Tackling debt, unemployment, housing problems etc ● Resolving prior conflicts ● Satisfaction of psychological and social needs legitimately <ul style="list-style-type: none"> ● Esteem ● Inclusion

Immediate causes of criminal event	Possible interventions in cause
<p>4. Resources for committing crime (See Ekblom and Tilley 2000.) These help offenders reduce risk and effort, increase reward, control conscience, by exploiting vulnerability of target, enclosure and environment, avoiding/ overcoming preventers, exploiting promoters, and networking with co-offenders</p> <ul style="list-style-type: none"> ● Skills ● Inside knowledge ● Repertoire of Modus Operandi ● Tools ● Weapons ● Transport ● Ability to overcome moral inhibitions ● Physical strength and social skills for intimidation/deceit ● Access to trusted network of collaborators (crime promoters) 	<p>Restricting resources</p> <p>Control of/ screening for/ design of</p> <ul style="list-style-type: none"> ● Weapons ● Tools ● Information on target's attractiveness and vulnerability ● Know-how/ MOs <p>Control of criminal organisations:</p> <ul style="list-style-type: none"> ● Recruitment ● Growth ● Efficiency

Immediate causes of criminal event	Possible interventions in cause
<p>5. Decision to commit offence</p> <p>Offender's immediate anticipation of / response to</p> <ul style="list-style-type: none"> ● Risk ● Effort ● Reward ● Conscience ● Provocation <p>And more strategic decisions on whether this kind of crime, or the criminal career, are worthwhile</p>	<p>Deterrence</p> <ul style="list-style-type: none"> ● Increase perceived risk of getting caught ● Increase perceived costs of getting caught <ul style="list-style-type: none"> ● Formal – arrest and punishment ● Informal – shame ● Personal – guilt ● Discouragement <ul style="list-style-type: none"> ● Increase perceived effort ● Reduce perceived reward
<p>6. Offender presence in situation</p> <ul style="list-style-type: none"> ● Routine activities of offender ● Crime attractors – motivated to look for crime there (see environment, enclosure) ● Free to enter or circulate in crime situation ● No detectable traces left 	<p>Excluding offenders from crime situation</p> <ul style="list-style-type: none"> ● Segregating conflicting groups ● Closing roads and paths ● Attracting offenders elsewhere ● Exclusion of specific offenders ● Enhancing traceability

Immediate causes of criminal event	Possible interventions in cause
<p>7a. Target property</p> <p>‘Hot product’ (Clarke 1999) Object, service, system or information that is</p> <ul style="list-style-type: none"> ● Concealable ● Removable ● Accessible ● Valuable ● Enjoyable ● Disposable <p>(Mobile phone = typical example)</p>	<p>Reducing target vulnerability/ attraction</p> <ul style="list-style-type: none"> ● Target hardening ● Concealment ● Target removal ● Value reduction ● Reducing provocativeness ● Property identification
<p>7b. Target person</p> <p>(Passive aspects of person who is the target in him/herself, as with revenge or honour assaults, or who becomes target in course of robbery of property. Active aspects are covered under ‘preventers and promoters’)</p> <ul style="list-style-type: none"> ● Vulnerable ● Accessible ● Provocative (take care over this!) 	<p>Reducing target vulnerability/ attraction</p> <ul style="list-style-type: none"> ● Target absence/avoidance ● Reducing provocation (careful)

Immediate causes of criminal event	Possible interventions in cause
<p>8. Target enclosure</p> <p>Compound, building, room, container, ATM lobby that is</p> <ul style="list-style-type: none"> ● Vulnerable to penetration at its entry point or its boundary ● Has a vulnerable interior ● Contains attractive and vulnerable targets 	<p>Perimeter/ access security</p> <ul style="list-style-type: none"> ● Adding enclosure and access ● Control of perimeter ● Control of access ● Screening at entrances/ exits ● Control of interior
<p>9. Wider environment</p> <p>Housing estates, town centres, transport interchanges, which encourage crime because they are:</p> <p>Logistically/ tactically <u>favourable</u> for the offender and for crime promoters, <u>unfavourable</u> for crime preventers</p> <ul style="list-style-type: none"> ● Concealment/surveillance (sight / sound) ● Rationale for legitimately being present – ‘cover’ ● Escape/pursuit ● Presence of promoters offering support/ turning blind eye <p>May <u>attract</u> the offence, or <u>motivate</u> it through the presence of</p> <ul style="list-style-type: none"> ● Attractive or vulnerable targets ● Conflict – such as a place where rival gangs fight for control over drug outlets 	<p>Environmental design and management</p> <ul style="list-style-type: none"> ● ‘Defensible space’ principles ● Aiding surveillance ● Intelligently planned lighting ● Setting/ communicating rules ● Conflict reduction (eg sound insulation)

Immediate causes of criminal event	Possible interventions in cause
<p>10. Crime preventers</p> <p>Potential victims, strangers, employees, police, probation, prison, private security staff, acquaintances, intimates who make crime less likely by playing active, or potentially active, roles involving</p> <ul style="list-style-type: none"> ● Shaping the <u>situation</u> or influencing the <u>offender</u> in advance of the criminal event (concealing phone, locking car doors when driving etc) ● Intervening during the criminal event ● Reacting after it (to make <u>next</u> event less likely) <p>Factors which</p> <ul style="list-style-type: none"> ● Alert ● Motivate and ● Empower preventers (resources including knowledge, skills, tools, eg forensic kit, CCTV) and perhaps ● Direct them (objectives, standards, regulations) 	<p><i>Boost preventers' presence, competence, motivation/responsibility</i></p> <ul style="list-style-type: none"> ● Extra surveillance of enclosed and wider environments ● Aids for preventers - alarms, CCTV ● Cultivating/ protecting witnesses and informants ● Informal social control ● Formal control ● Self-protection and avoidance

Immediate causes of criminal event	Possible interventions in cause
<p>11. Crime promoters</p> <p>Make crime <u>more</u> likely, by unwittingly, carelessly or deliberately</p> <ul style="list-style-type: none"> ● Shaping the situation or influencing the offender (supplying weapons, tools or information, inducing the offender's cooperation by illegal threat or reward, promising to buy stolen goods, promising to look away (corruption)) ● Intervening during the criminal event (giving encouragement, distracting the victim or preventers) ● Reacting after it (helping dispose of stolen goods and weapons, providing an alibi etc) <p>Factors which</p> <ul style="list-style-type: none"> ● Lull ● Deter and discourage ● Hinder promoters including denying them resources 	<p>Discouraging/deterring promoters:</p> <ul style="list-style-type: none"> ● Naming and shaming ● Civil/ criminal liability ● Tackling a criminal subculture ● Market reduction for stolen goods ● Procedural controls

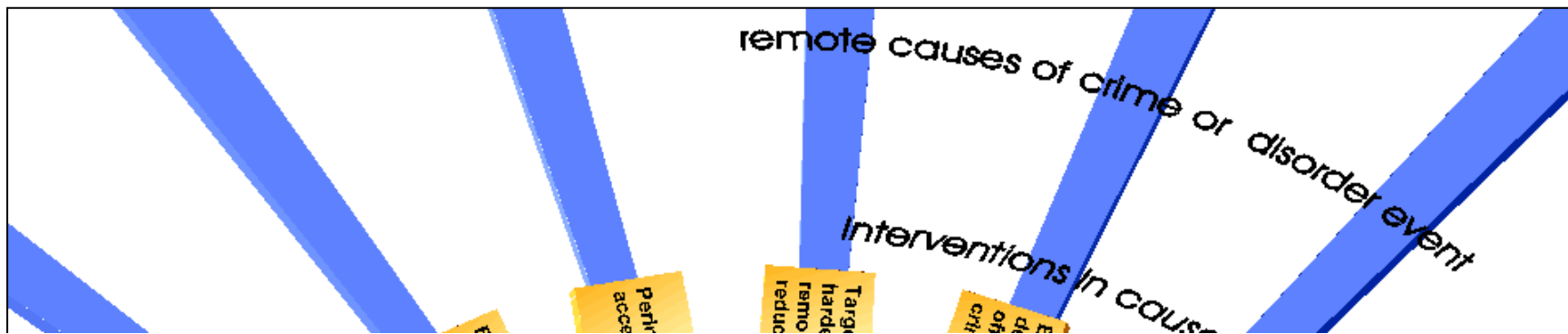


Figure 3

Causal mechanisms – how crimes happen and how interventions work – in context

Both causes of crime, and interventions in those causes, are best understood in terms of **causal mechanisms**.¹¹ Mechanisms take the description of interventions beyond the functional, and postulate *how* something works causally (eg ‘cycle stand resists damage *by rigid construction*’), but they are not necessarily fully technical (*rigidity* being a construction principle rather than something as specific as, say ‘...with buckle-resistant ribs...’ or even ‘...using interior cross-braces’). The operation of preventive mechanisms has been shown to be highly **context-dependent**. Much as a match causes fire only when properly struck, on paper, that is dry, and sheltered from wind, preventive mechanisms can be delicate and usually require a suite of conditions to be met before they can be successfully triggered. This often involves human perception, performance and choice. For example, the most secure cycle stand in the world will not protect the bike if the user fails to operate it properly or decides not to bother.

CCO was designed to reflect and support this understanding of mechanism and context. For example, an intervention may involve hardening a **target** against physical attack by making it protest either by alarm or simply the shriek of tortured metal joints, thereby increasing the risk to the offender of being detected and arrested. The immediate **contextual conditions** necessary for that intervention mechanism to work can be described in terms of the **remaining 10 causes of CCO**. For example, **preventers** have to be present within earshot, they have to be motivated and capable of responding; **offenders** have to perceive this possibility and to be concerned about it because the **environment** doesn’t allow them to see people coming or to escape pursuit, and so on.

CCO and Design Against Crime

Design Against Crime has to influence the risk of criminal behaviour by manipulating elements of the immediate crime **situation**¹² to realise the intervention principles, and in particular to have a good chance of triggering the appropriate causal mechanisms in the particular context of use.

This involves either physically **blocking** the offender’s action (the wall cannot be climbed); affecting the offender’s **perception of risk, effort and reward** (the wall looks difficult or dangerous to climb and impossible to lift stolen bikes over); or influencing any **prompting, pressuring or provocation** of the offender (such as an officious notice provoking graffiti). As well as influencing these factors **directly** DAC can influence the **other roles** (preventer and promoter) who then in turn exert their **own** influence on the situation (the householder can lock their doors and windows; the cyclist is guided by the shape of the bike stand designed to lock the bike

¹¹ The ‘Scientific Realist’ approach –Tilley (1993).

¹² It can also influence people’s readiness to offend via current life circumstances such as stressful living conditions, but this is beyond current scope.

securely; and the facility manager can be informed by designed communications about kinds of suspicious behaviour to look out for.)

CCO was considered a good starting point for introducing criminological concepts and perspectives into DAC because it:

- Maps immediate causes of criminal events and counterpart interventions exhaustively, systematically and generically (hence maximising design scope and design freedom)
- Allows indefinite zooming into detail rather than remaining at the level of broad generalisation (important for adjusting to context and to moving from design-in-principle to design-in-practical-terms)
- Supports a mechanism and context approach to the understanding and prevention of criminal events (allowing for a necessary subtlety of design)
- Involves both objects, places and people (covering the full scope of the design field)
- Considers people as users or abusers, in a range of roles rather than focusing in a limited and inflexible way on offenders, guardians and managers
- Provides designers with analytic principles of crime prevention which complement the more tangible and in some ways more restricting 25 Techniques of Situational Crime Prevention¹³ (further discussed in the Conclusion)
- Although CCO sits well with Situational Crime Prevention, it does not tie designers (or those developing innovative capacity for designers) down to one particular theory or set of theories or approaches within crime prevention, allowing a potentially broad transfer of knowledge, even from the offender-oriented side as appropriate

Before moving on, one final point should be made about the source of CCO knowledge. Although CCO has been presented as a **theoretical** framework it did not spring out of empty space. It was in fact a distillation of a wide range of *generic* crime and crime prevention research, plus a specific attempt to classify several thousand diverse preventive projects.¹⁴

CCO and the Bikeoff Project

CCO was introduced to colleagues at the DAC Research Centre from around 2005 with the arrival in post of Paul Ekblom. During early work on bike crime at the Research Centre CCO was presented as an input to various studio projects with MA Industrial Design students at CSM. Subsequently it was considered by the rest of the team planning the current Bikeoff Project, and was judged suitable to give an angle on the development of standards and guidelines for bike

¹³ www.popcenter.org/25techniques/

¹⁴ Ekblom (1994, 2000). A note on the origins of CCO is at www.designagainstcrime.com > crimeframeworks. CCO was originally called 'Proximal Circumstances'.

parking security, which was both plausible and complementary to the gleaning and distillation of worldwide practical experience.

As the Bikeoff project unfolded, CCO was brought together with the other work, and introduced to the other team members, in various ways. These efforts involved tutorial discussions; iterative construction and discussion of a range of diagrams with the aid of a graphic designer; drafting of written documents and tables; preparation and presentation of slideshows. In each case strong and sometimes fierce feedback from within and beyond the WPA team moved the work onto the next iteration.

CCO was meant to provide an independent angle on bike parking security, and the intention was to test its performance and suitability to this task. To these ends, the author (Paul Ekblom) was not involved in the meetings and circulations to distil the Best of Breed material under WPA1, except for a brief viewing of a sample format in order to guide the CCO output in a similar direction. However, in order to 'program' the generic CCO framework with bike-specific knowledge, so that it could generate bike-specific output, he did require information on **bike crimes** (especially perpetrator techniques), **bike parking design categories** and the **range of existing kinds of design of furniture and facilities** and what functions they sought to serve in general terms (such as 'support bike', 'collect payment' etc).

Moving on from CCO-Classic

During the course of this process several factors originating both within and outside the Bikeoff work caused the original CCO-Classic framework to evolve in significant ways:

- Detailed application of CCO in a highly-focused practical context caused many assumptions to be examined.
- So, too, did attempts to incorporate CCO within a design process, and to articulate and communicate it to both the designers on the Bikeoff project and design students in associated studio workshops.
- CCO by itself was found to be too generalised in the way it handled crime for it to give designers enough of a steer. A way of tuning it to specific crime types (such as theft) was required.
- Fresh and challenging ideas emerged from parallel work on a journal article (Ekblom and Sidebottom 2007) in critiquing and attempting to solve conceptual and terminological problems in a procedure for systematic 'crime-proofing' of domestic electronic products (in other words, assessing how far the crime *risk* to which they would be exposed in everyday use, was matched by appropriate levels of product and environmental *security*). The criticism of existing approaches extended to some quite fundamental aspects of SCP.¹⁵ For example, the interpretation of 'risk' and the definition of crime prevention were

¹⁵ See also Ekblom and Sidebottom (2007b).

further developed. These changes had implications of how the concept of risk was to be used in both CCO in particular and DAC in general.

- A recently-completed book chapter ‘Making offenders richer’ (Ekblom 2007c) raised the level of understanding of human agency in crime and crime prevention, and how to represent it.
- Previous development of the 5Is framework,¹⁶ a process-model of doing crime prevention, suggested how to systematically incorporate ways of involving people as crime preventers.

These influences led to a range of modifications and extensions to CCO-Classic, which continued to evolve in the course of the current project, and more widely.

- Pressure to define what the elements of CCO were, exactly, led to the distinction between ‘**entities**’ (target, enclosure, environment, material resources – which can be designed) and ‘**agents**’ (offenders, preventers, promoters – who can be influenced by design, and who react and respond to installed designs – and their mental properties and resources for or against committing crime).
- Entities were given the design- and engineering-oriented attributes of causal **properties**, structural **features**, **components** and **configurations** and material **composition**. A more detailed **hierarchy of properties** etc (such as space, access, visibility) is in development beneath these main headings.
- Human agents were seen as both **caused** (through internal mental states and by their environment) and **causing** (in terms of striving to fulfil goals of both achievement and avoidance by more or less planned behaviour). They interact with installed designs in both ways.
- To ensure that the ‘abuser-unfriendly tail does not wag the user-friendly dog’, efforts were made to render the basic terms and concepts underlying CCO and its interface with design, compatible with ‘honest’ cognition and behaviour of **legitimate** users.
- Understanding of influences on such users, and how designers can systematically seek to **involve** them in crime prevention, was enhanced by incorporating elements of the **CLAIMED** framework,¹⁷ which itself originated as a distillation of how designers were/were not involved in crime based on a reading of a Home Office/Design Council-commissioned study of the state of design against crime circa 2000 (Design Council 2000; Learmount 2005). This is set out in Box 1 below.

¹⁶ See www.designagainstcrime.com/index.php?q=taxonomy/term/6

¹⁷ See www.designagainstcrime.com/index.php?q=taxonomy/term/6

Box 1 The CLAIMED framework

CLAIMED – the generic procedure for mobilising crime preventers to implement particular interventions – comprises several steps:

- **C**larify the crime prevention tasks or roles that need doing, eg the intervention itself; alleviating constraints; and supplying enablers.
- **L**ocate the individuals or organisations best-placed to undertake them, including designers, manufacturers, marketers and consumers. Then
- **A**lert them that their product could be causing crime, or that they could help stop unrelated crimes.
- **I**nform them of the nature of the crime problem, its causes, likelihood and consequences.
- **M**otivate them – by hard or soft incentives including an image of corporate social responsibility, naming and shaming, 'polluter-pays' taxes, awakening consumer expectations and pressures and imposing insurance costs, and legislation.
- **E**mpower them – by supplying preventers with education, guidance on intervention, tools (eg property-marking kit) and other resources; and by alleviating a range of constraints.
- **D**irect them, perhaps, in terms of standards (such as BSI or CEN), and targets. Regulations relating to privacy or anti-vigilantism may also be applied to stop people taking crime prevention beyond acceptable limits or clashing with other values.

- Designers needed a more detailed representation of the dynamics of offending, beyond the elementary 'criminal's decision to offend based on perception of risk, effort and reward'. This was achieved by introducing the concepts of routine **scripts** (Cornish 1994) pursued by offenders (such as '*seek parked bike, see, select, release, remove, escape, sell*') and incorporating specific 'perpetrator techniques' of the kind identified and applied within prior bike crime research at DAC, such as lifting, cutting, picking etc).
- Given the parity of user and abuser in DAC approaches, the concept of **user** scripts was introduced (such as '*seek bike parking facility, see, enter, select and approach free stand, lean and lock bike, leave... return, unlock bike, remove bike, use bike*').
- This in turn generated the potentially fertile concept of **script clashes** between the two agents (eg '*concealment v surveillance*', '*pursuit v escape*'). Script clashes were found to relate to the **contradictions** whose specification is at the heart of the **TRIZ** approach to systematic invention.¹⁸ They were felt to be particularly useful for designers to be aware of in envisaging the dynamics of the potential or actual criminal events that they were seeking to influence. The key task, of course, would be to design the environment, product etc in such a way as to consistently and significantly favour performance of the script of the 'goodies' (users, managers, guardians, concerned passers-by) over that of the 'baddies' in any clash.

¹⁸ See for example Savransky (2000) and Ekblom and Sidebottom (2007b).

- Clear **definitions** of the crime to be prevented (such as theft) were judged necessary to focus the mind of the designer. In the course of this it was realised that such statements themselves introduced the most fundamental and defining contradiction – in the case of theft, between **legitimate and illegitimate acquisition, possession and disposal** of the target item.
- The factors of **risk, effort and reward** underlying the offender's choice in classical SCP, whilst important for designers to consider, cannot be manipulated in any simplistic, mechanistic way, as much of the SCP literature and guidance tends to imply. To the **adaptive offender** these factors are **interchangeable currency**. For example, to obtain greater *reward*, the offender may tolerate greater *risk*; to reduce the *risk*, the offender may increase the *effort* such as by taking greater care to cover tracks. (Although 'displacement' of crime to other places, targets or times has been shown to be only a limited problem in SCP in the immediate aftermath of deploying preventive interventions (Hesseling 1994), offenders over a longer time period (Ekblom 1997, 1999, 2002, 2005a) may adjust their perpetrator techniques to these and even develop new countermoves.)
- Risk, effort, reward and various motivating factors should not be treated as the exclusive preserve of the offender point of view, as is done in classical SCP. They were seen as equally important for **understanding and influencing the behaviour of other agents** such as users or place managers acting as preventers or promoters (or indeed doing everyday activities unconnected with crime).
- **Risk** itself required a clearer definition than what we now see as a rather restricted but also imprecise usage within Situational Crime Prevention. *There*, risk centred on offenders' perception of likely harm to themselves, usually in terms of arrest after the event, and how this influenced their decisionmaking. Considerations of probability and harm were not clearly distinguished. The conception of risk used *here* goes beyond risks to offenders to include the risks to other agents and entities potentially involved in the criminal event itself. An approach to risk was therefore developed that relates to the way the concept is used within the '**security and risk assessment**' field (Ekblom and Sidebottom 2007a) and that of **harm reduction**. Risk is therefore considered as 1) **possibility** – a particular kind of **hazardous event or human threat**, 2) with a **probability** of occurrence and 3) with particular **harmful consequences** which may be immediate or 'knock-on'. Risk could apply to all agents, and to the product of design.
- Designers needed to explicitly consider **harm** associated with, or following from, the criminal event. This is for two reasons. Designers themselves, and their clients, need information on harm to **prioritise** requirements for the designed product or place, and perhaps for users with particular susceptibilities such as the elderly or blind. And specific knowledge of harm could **inform designs** to avoid, reduce or mitigate it during and after the criminal event should this still happen despite attempts to reduce its probability. Harm can come from **crime and its consequences** such as mental trauma or loss of credit cards (crime

propagation). But it can also come from **inept prevention** such as trapping of fingers in badly-designed locks or neglect of fail-safe considerations in the event of damage to stands, barriers etc. Even aesthetic offence can be considered as harm to quality of life.

- Another risk management concept it was thought helpful to incorporate is that of the security sequence:
 - **Primary security** – this reduces the **possibility** of harmful event; and if event nevertheless remains possible, it reduces its **probability**
 - **Secondary security** – if event does happen, this limits **harm** as it unfolds to product, owner and beyond – i.e. increases **resilience** of product and **immediate** system
 - **Tertiary security** – this limits **propagation of harm** that may occur post-event – e.g. increase shielding against misuse of product – and increases **resilience** of **wider** system

From a design perspective, it is usually preferable to put most effort into primary security – so the undesired event is much less likely to happen. But there may be circumstances where it becomes less cost-effective to aim to prevent every last product or place from every last incident, and instead to dedicate some resources to making the product or place resilient, and to limit crime propagation.

- Deliberate attention was paid to **discourse** – to take particular perspectives and ways of articulating crime and design (such as ‘functional’ v ‘technical’) in a deliberate and self-aware way, with consistent use of terms, rather than haphazardly and unconsciously slipping between different discourses in the same analysis or sometimes even the same sentence, as SCP is wont to do. In particular, the ‘caused agent’ approach mentioned above automatically leads designers into consciously choosing whether to think about users and abusers in terms of what causes their behaviour and how to block these causes; what goals they are pursuing and how to frustrate or disrupt them, and how to influence their choices; or some combination.¹⁹
- To move from consideration of crime in general, to specific types of crime, it became necessary to combine CCO with an additional framework – **Misdeeds and Security** (M&S)²⁰ – from the same conceptual stable. M&S describes the crime risks and crime prevention opportunities that may be associated with a designed product, place or system. Rather than confront designers with dozens of legal categories of offence or nuisance, these can be summarised under broad headings of **misdeeds** in which the designed object is either the target of crime or otherwise a contributor to crime directed at something or someone else.

¹⁹ These twin discourses have also supplied alternative ways of defining crime prevention. See www.designagainstcrime.com/index.php?q=node/37

²⁰ Ekblom (2005b); see also www.designagainstcrime.com/index.php?q=taxonomy/term/6

Likewise, where the designed object is self-protected against being a target or contributor, or can positively contribute to preventing crimes directed against other targets, these crime prevention opportunities can be summarised in the counterpart list of **security** considerations. Note that these are essentially different discourses for describing the same thing – ‘beware of risk X’, and ‘reduce risk X’. The latter of course is a functional specification – and amounts to guidance, but not a standard. M&S is set out in Box 2 below.

Box 2 Misdeeds and Security framework

Identifying types of crime risk to or with designed products and functionally specifying what to do about them; and how to exploit their protective function in reducing crime against other targets

Misdeeds

Each designed product, place or system (hereafter product for brevity) is considered in relation to the possibility, expressed in CCO terms, that it is at risk of being a **target** of crime; or a **contributor** to crime risk by virtue of being a **resource**, an **enclosure** or an **environment**.

In each case the risk is taken as **increased** (so for example we consider **inadequacies** of enclosures which let offenders in).

● Target of crime

- **Misappropriated** – property stolen, information stolen or made unavailable;
- **Mistreated** – property damaged, people assaulted, self-harm, information integrity compromised;
- **Mishandled** – property subject to deception, counterfeiting and smuggling; confidentiality of information breached;

● Contributor to crime

- **Misused** – as resources for crime (such as tools, or an enclosure acting as a 'decoy trap' for robbery) to support a specific perpetrator techniques;
- **Misbehaved with** – creating an **environment or enclosure** conducive to disorder and antisocial behaviour;

- **Mistaken** – a category of a different order – errors are also made by public or police which whilst not illegal serve to constrain or misdirect crime reduction activity (e.g. false alarms, arresting the wrong person).

Security – identifying and specifying counterpart crime reduction opportunities

The security perspective takes the above risks and considers how the designed product, place or system might be designed to be **self-protected** against crime; or **exploited to reduce crime** committed either by preventing misuse or misbehaviour with the product itself, or by using the product to make a positive contribution to **preventing crime against some other target** (in the present case, mainly the bicycle and/or its human user):

● Self-protected

- **Secured** against theft – resistant to theft, indicating that theft has happened, or recoverable/ restorable to owner;
- **Safeguarded** against damage – resistant to, fail-safe in, or indicative of damage;
- **Scam-proofed** – resistant to or indicative of fraud/ counterfeiting/ smuggling;

● Reducing crime from misuse or misbehaviour with product

- **Shielded** against misuse – resistant to misuse, including for attacks on law enforcers, or indicative of misuse, including tamper-evidence;

Standards or guidelines?

One other thing became clear during the course of the process of adapting CCO to the design process. The original aspiration of the Bikeoff project was to develop ‘CCO standards’. But the present exercise made it abundantly clear that CCO, M&S and CLAIMED in themselves can only directly support the development of *guidelines*. *Standards* require extra information derived from specific, focused research studies and practical trials so that created designs can be assessed against them. These can only be imported from outside of CCO. The only sense in which CCO etc could be treated as a standard is in **process** terms – e.g. ‘this design was generated and tested using the CCO framework – which could indicate a certain methodological rigour.

CCO-Dynamic

For brevity, the wider framework is hereinafter referred to as **CCO Dynamic**.²¹ As used in the current exercise, this is essentially captured in the CCO Dynamic slideshow www.designagainstcrime.com/index.php?q=node/83, supplemented by descriptions of the CLAIMED and Misdeeds & Security frameworks – respectively www.designagainstcrime.com/index.php?q=node/85 and www.designagainstcrime.com/index.php?q=node/77.

²¹ On the DAC website (crimeframeworks section) the three frameworks are currently listed separately and CCO Dynamic therefore has a somewhat more restricted content.

3. Applying CCO Dynamic: development and application of a procedure

The rest of this document describes the **overall procedure** which has evolved for handling the generation of design guidance using CCO Dynamic; the framework for **analysing the risks**; the framework for the response to that risk, namely for **design guidance**; and the complete prescriptive design guidance **output**. This is followed by a brief conclusion.

Developing the procedure

Initial attempts to develop risk analysis and design guidance worksheets led all the way to design solutions, including both functional solutions (eg 'resist cutting tools') and technical realisations (eg 'by using hardened steel and by denying space to deploy tool'). These were subsequently judged to be overambitious for current purposes but may be returned to after the present project. In order to complete WP A2 on time, cut-down versions were developed which the author, with his familiarity with the frameworks, was able to apply. These stopped at functional design considerations:

Design as object and design in-function

An important distinction emerged during the development process, which now features in both risk analysis and design guidance. Some objects, places or systems are designed to be inherently secure – **secure products** – such as the car with built-in immobiliser. Others are purpose-designed to protect *other* things, places or people against crime. **Security products** are purpose-built to protect, with no other function – for example locks, body armour or attack alarms. **Securing products** can protect other things or people in the course of supporting some other designed function – for example, the Stop Thief chair in a café which hitches a customer's handbag beneath her knees to protect it from theft – whilst serving as a perfectly comfortable and attractive seat. The bike stand in the present project is a securing product, deliberately designed to protect the bike from theft whilst also supporting it in a safe and convenient position. The design of security and securing products relates to crime in two ways:

- Design **as object** sets aside the security function and takes the offender's perspective on how the product, place, system or communication itself can become target, resource or environment for crime. This covers what criminals can do *to* or *with* the product, i.e. actions with criminal intent that were *not* intended by the designer, purchaser, installer or user – for example, the bike stand could itself be damaged for amusement, stolen for scrap or climbed on to escape the police over a wall.
- Design **in-function** covers the intended security function designed into the product, place, system or communication. The risk analysis is not primarily of threats to the designed object (although it may get damaged in the course of the offender's action), but to the person or property (such as the bike) whose security the object is intended to protect. Considering the bike stand in this light, it makes sense to risk-assess the functional whole of bike + lock + stand. It identifies the risks to the designed object, and those things that it protects, in

serving its intended security purpose (eg the stand protecting the bike from theft; or the enclosure of a parking facility protecting the bikes from theft, and protecting the stands themselves from damage or theft). In other words, these risks are **risks of failure of the security function**. Of interest here, of course, are criminals' **countermoves** to the security function (eg preventer incorporates locking function; offender attempts to overcome/ bypass locking function). Note however that the elementary security function of **self-protection** comes under design-as-object above.

A snappy way of expressing the difference between design-as-object and design-in-function is 'to versus do': what happens *to* the designed furniture or facility in the way of crime (and with it, as a tool, weapon or environment for crime); and what does the furniture or facility purposefully *do* to affect the risk of crime, whatever other functions and requirements it serves?

The procedure for risk analysis and security guidance – an overview

The final version of the procedure that applied CCO to generate design guidance is as follows:

- a) Select a '**design focus**' (furniture, eg a cycle stand or cluster of stands; or the wider facility comprising stands, enclosure etc). Where relevant, break this designed entity into components (eg enclosure considered as a working whole comprising periphery, barrier, entry point, interior).
- b) Consider the **design as an object**, at least from a **crime** perspective – then consider the **crime risks** associated with that furniture or facility, following the sequence **possibility > probability > harm**, using a systematic analytic structure based on CCO-dynamic, supplemented by wider sources of information described in the section immediately below.
- c) Having identified the crime risks, recast them in terms of **design considerations** (guidelines) whose purpose is to alert, inform and empower the designer to reduce the crime risk (whether by reducing possibility/probability, harm or both). These are essentially in high-level functional discourse and can be mapped across from the causal to the intervention side of CCO. For example, *bike stand as target is vulnerable to wrecking* (causal) becomes *ensure bike stand resists wrecking* (intervention). Where standards are to be developed, more specific and measurable **construction or performance requirements** can be produced, but as explained above, not in this study.
- d) and e) Repeat a) and b) for the **design in-function**, from a security perspective, and clearly express the security considerations. For example, consider the [stand + bike + lock complex] as a functional secure configuration and list desired properties such as *may shelter environments and pedestrian/cycle users in vicinity of stand against nuisance and conflict by keeping bikes out of way of pedestrian paths*. Include risks of failure of the security function and criminals' countermoves, as discussed above.

It is impossible to specify absolutely everything in risk analysis or design guidance. There are hundreds of variants, contingencies and contexts of design. Moreover, the entities and agents interact in complex ways – for example, the **resources** for surveillance possessed by the guards of the site will interact with the **potential** for surveillance offered/constrained by the instrumental environment (eg guard has torch or CCTV, site has blind recesses or bushes that obscure the view), but we can present some common issues in an organised way, and give systematic leads to help the designer (whether the designer of the guidance, or the designer using the guidance to create the product itself). The hope is that the more advanced designers (or at least the ones allowed a wider/freer remit by their clients) use the framework to envisage wider possibilities, constrained only by their ability to imagine crime and put themselves in the minds of criminals whilst taking in research evidence and contextual considerations. The less advanced designers or those heavily constrained in time and scope can fall back on the minimum.

To help readers keep track of where they are in the risk analysis and later the design guidance, a colour coding schema was adopted (Table 2). This is consistent throughout the documentation.

Table 2 Colour code – risk analysis for designed objects	
Design focus	What's designed – <i>product, place, communication</i>
Possibility of crime	Causal role designed object plays in crime – <i>CCO entity</i>
	General kind of crime risk involved – <i>Misdeed</i>
	The detailed possibilities of criminal events – <i>specific crime type and/or perpetrator technique</i>
Probability and Harm	For each possibility of crime, how its risk – probability and harm – is influenced by design of product and/or the physical/social context in which the product or place is located, using the agents and other entities within CCO and if necessary higher, emergent levels such as markets and networks

4. The risk analysis

As with skinning cats, there are many ways in which bike parking furniture and facilities can play a part in crime. Each of these ways will in some way involve the **design** of the product or place of interest (in the present case, the design can variously comprise the stand and other furniture, the stand-bike-lock complex, cluster of bikes or full parking facility); and the **context**. The context in turn will comprise other CCO **entities** such as environmental features like walls or barriers; and human **agents** including other users, passers-by, guards and managers. Note that the complicity

of the design in crime will often be implicit, and will have to be drawn out by application of a focused mindset. Note too that in some cases the context of one designed product (such as the stand) can *itself* be subject to design (eg the wider environment can be security-adapted, whether this is done by minor modifications or the creation of a specific, designed enclosure).

This report takes four 'orbits' round the risk analysis, to describe it in successively greater detail. First (Orbit A), it briefly rehearses the basic concepts of risk analysis described under Section 2 above (The CCO approach to design). This is linked to the colour code just described. Then (Orbit B), an annotated blank template for undertaking the risk analysis is shown in Table 3 below, together with a commentary on the procedure for filling it in. After that (Orbit C), all the crime possibilities considered in the full analysis are set out. Finally (Orbit D), there is a worked example of the full risk analysis for the first of the crime possibilities just set out. (A full risk analysis for *all* the crime possibilities, for *bike parking furniture*, is in Appendix 1.)

Orbit A: Basic concepts of the risk analysis – a reminder

Risk of crime comprises three aspects: **possibility** (what kinds of criminal events might happen), **probability** (how likely is each kind of event to happen) and **harm** (what are the immediate and wider undesirable consequences if the event happens). **Possibility** could be left entirely to the designer's imagination, but since untutored designers are unlikely to be very effective at thinking thief, it is better if their ideas are systematically structured as follows, using the colour code set out above.

We start the risk analysis with the **design focus** – that which is designed. In the present project this could be the furniture or the facility. Each design focus receives its own risk analysis. An important distinction within the design focus is between the **design as object**, and the **design in-function**.

We consider design as object first.

Within design as object, we move on to **possibilities of crime**.

Using, first, the language of CCO the product (and its design) can first be characterised in terms of the very general causal roles it may play in crime. It can act as **target** itself or as a contributor to other products or persons becoming targets, by acting as a **resource** for crime like a tool or weapon or an **environment** for crime.

M&S is then used to identify rather more specifically what *kinds* of crime risk the product is implicated in (Mistreatment, Misappropriation, Mishandling, Misuse, Misbehaviour; also Mistake).

Then finally we get very specific, considering (for example under Mistreatment) very particular crime possibilities defined by a combination of legal category (eg criminal damage) and perpetrator technique (eg by wrecking).

Having teased out major **possibilities** of criminal events into some detail, we then consider for each of these possibilities, their **probability and harm** (white in the colour code). (If the possibilities are the trunk, branches and twigs of the tree, then probability and harm are the leaves and rotten fruit at the end of the twigs.) For each detailed possibility, we ask how the **design of the product**, and how the **physical and social context** in which it is to be sited, each serve to influence the probability and the harm of the criminal event.

Design in-function

The procedure here is similar, except that the **target of crime** is no longer the designed object itself (eg the stand), but **that which it is designed to protect** – the bike, which is at risk for example of **misappropriation**, say by **cutting the stand**. A successfully-completed crime targeting the bike, represents a **failure** of the security function of the stand; in the course of this security failure, the stand itself may get damaged. (Note that things are more complicated because even unsuccessful attempts at **theft** may still **damage** both bike and stand itself; this still confers some limited benefit to other users because it may discourage future attempts.)

Orbit B: The risk analysis template

The sequence just described is illustrated in more detail in the headings of the ‘blank’ risk analysis template, presented in Table 3 below. With reference to that table, for example, we can:

- Take *furniture/bike stand* as the product which is the **design focus** (level 1, grey); and consider it as object, and then in-function.
- The stand can be considered in terms of whether it could play any or all of the **CCO roles** (level 1.1-1.5, light blue) of *target of crime*, *resource for crime* etc.
 - Under **target**, switching to the **M&S framework** - (level 1.1.1. – 1.1.6. yellow) it can then be considered as an object which can be *mistreated* (damaged), *misappropriated* (stolen), or *mishandled* (eg counterfeited).
 - The level-numbering scheme repeats hierarchically, so under **1.2 resource for crime** it can be *misused* (1.2.4 in M&S framework, not shown in Table 3) (eg as a climbing aid for burglary, or a place to hang a bomb) or *misbehaved with* (1.2.5, eg sat on, climbed on etc).
- Each of these **specific possibilities** of types of criminal event illustrated in brackets will need to be considered in turn, appearing in purple, eg level 1.1.1.1 *Wrecking*.

- Then we go into the **detail** of this specific crime possibility (1.1.1.1.1. white... and progressively down the hierarchy of numbering as appropriate). This includes a description of the defining perpetrator technique, legal offence category etc of this particular crime possibility; also some consideration of whether this is an **instrumental** crime (a means to an end, such as ‘acquiring money’) or an **expressive** one (such as ‘having a laugh’, or ‘retaliation in response to provocation’ such as when a coin machine swallows the user’s money and then jams, turning user into abuser). The crime preventive options, and the design ones in particular, may differ depending on which is in play.

Each specific crime possibility is then considered in terms of its **probability** of occurrence and the *harm* occasioned if it happens. Both of these have design implications; and both occurrence, harm and the design response may depend on context.

Under **probability** (1.1.1.1.2.), we first consider its *overall magnitude* (1.1.1.1.2.1.) with a crude scoring system 0-Low-Medium-High. Later, the same is done for harm. This leads to several alternative ‘action contingencies’ for the designer and client:

- If **probability is judged high and harm high**, then intervention (by design or other means such as guardianship) is vital.
- If **probability is high and harm medium to low**, then ‘volume crime’ considerations of cost and inconvenience may mean it is still worth investing in prevention.
- If the **probability is very low but the consequences very serious** (such as a terrorist bomb in a crowded place) then other priorities may dictate action.
- Obviously if the **probability turns out to be very low and harm equally low** (and likely to remain so over the intended lifetime of the product) the designer may choose to ignore this possibility altogether beyond noting it for the record.

Otherwise we continue, by identifying factors which influence the *magnitude* of the probability (1.1.1.1.2.1.). In other words, what factors affect how likely this possibility is to happen? Two broad influences are of interest – the *design* of the product/place (1.1.1.1.2.2.1.), and the *context* (1.1.1.1.2.2.2.). (From now on the hierarchical heading numbers in the table will be omitted.)

With *design*, it is necessary to express the design factors in a way that reflects how the properties of the designed product could influence crime – eg *strength* could influence susceptibility to damage by bending; *value* could influence probability of theft. We also consider how the design *features* (distinguishable structural elements of construction, components etc) and *materials* convey these properties. This is a major shift in mindset whether the risk analysis is being conducted by a designer or a criminologist/crime scientist.

Under *context*, possibilities are endless. But to maintain focus, and limit what has to be considered, we return to the CCO to supply headings. While the product/place we are

considering has already been identified as a CCO category (in the current example, target or resource for crime), the elements of the context can also be systematically listed in terms of the *other* causes within CCO.

These contextual causes can be broadly classed as

- *agents* (humans acting as offender, crime preventer or crime promoter) or
- *entities* (environment, enclosure, resources for offender or preventer; even target of crime if the product we are considering is acting as a resource such as a tool or climbing aid – here the target would be the goods to be stolen in the house whose back wall is climbed over).

Within the *environment* we can include some standard headings to describe generic properties relevant to crime, eg surveillability, accessibility – drawn from CPTED (Crime Prevention Through Environmental Design).²² These also apply to the *enclosure*, whose interior is itself a mini-environment). The **scale** of the environment may need explicit consideration – micro, meso or macro. Product designers will usually start from the product and work outwards into its environment of use; designers of facilities/places will work from the facility as a whole to its detailed content. The present risk analysis (and the accompanying design guidance) is intended to link these perspectives together.

Of course, there may be interactions between the properties of the product and those of its context, eg camouflage of product only works if the background of the environment is of similar appearance. In particular, what the various agents are capable of doing with the environment, the target etc, are important. For example, for surveillance to work the *environment* has to be surveillable (sight lines, lighting levels etc) and the *agent* has to be capable of undertaking the surveillance (good eyesight, knows what to look for etc) and motivated to respond.

Crime *preventer* is a role which can be undertaken by many people – here we have focused on *user* (cyclist), *passer-by* (normally anyone but could be subdivided to include eg police patrols or site employees with no specialist role in crime prevention but maybe a general responsibility) and *manager or guard* with clear responsibility, and perhaps training and equipment, for maintaining good behaviour and security at the site. Note that these people could equally well serve as *promoters*, making crime more likely to happen (eg by locking their bike insecurely, or by thoughtlessly locking through another bike leading to conflict). The idea of much prevention is to transform careless or inadvertent promoters into positive preventers. And a passer-by could suddenly turn into an opportunist thief if an expensive bike was left insecure; or a bike facility user could deliberately damage another's bike after an argument.

Preventers, promoters and offenders all have factors of interest such as presence, perception, motivation, mental resources such as skills and knowledge for secure locking or stealth, and

²² There may be scope to revise the terms and concepts of CPTED along the lines of the frameworks set out here – see www.designagainstcrime.com/index.php?q=node/80.

material resources such as locks, or tools for breaking them. Offenders may either bring tools with them (risking being caught for 'going equipped'), or find them near the crime site (eg bricks or sticks). It is here that the designer has to think thief, think preventer or think promoter in relation to each of the various non-crime roles that are likely to be present in the environment (in or around the parking facility and/or the bike stands) – users, managers, passers-by etc – their goals and scripts, and any script clashes between conflicting agents.

The entry 'wider opportunity structure' (Clarke 1997) goes beyond the contextual risk factors described by CCO and considers possibilities such as the existence of criminal networks or a nearby market for stolen bikes (in the case of Brick Lane, East London, the market is not just an economist's abstraction but literally a street market).

The final section on **harm** considers, first, *immediate* harms mediated by the **design** of the product itself – harm to the product during the criminal event (eg stand scratched during bike theft), and *after* the event – harm from the design of the product if the criminal attack leaves jagged edges which can scratch people. Then *wider* harms are considered – these are knock-on consequences of the crime – for example, those whose bikes are stolen may decide not to replace them, and hence the benefits of cycling to individuals and community are lost. Again, there may be **contextual** influences on harm – for example, if there are blind people regularly walking in the vicinity of some bike stands, the probability of an injurious incident from a damaged stand is higher.

Finally, some global judgement is made about the severity of these harms, to feed into priority decisions in design, as discussed under magnitude of probability above.

This completes coverage of the risk analysis as illustrated for the design as object; a similar one would now be done for the design in-function.

Table 3 Bikeoff - CCO-M&S worksheet – risk analysis – template of standard headings plus interpretation	
Standard headings	Interpretation
1. Design focus – what’s designed	* Furniture/bike stand (or Facility – repeat for each that applies) * As object; or serving a security function
The causal role the designed object plays in crime	As a CCO entity – repeat for each that applies
1.1. Target of crime	
1.2. Resource for <i>committing</i> crime	
1.3. Enclosure	
1.4. Environment	
1.5. Resource for <i>preventing</i> crime	Later recast as separate statement of security functions of the designed object – ‘in-function’

<u>M&S framework - General kind of crime risk involved</u>	Misdeeds & Security framework – repeat for each that applies
1.1.1. <u>Mistreated (Damaged)</u> by	
1.1.2. <u>Misappropriated (Stolen)</u>	
1.1.3. <u>Mishandling</u>	
1.1.4. <u>Misused</u> for	
1.1.5. <u>Misbehaviour</u>	
1.1.6. <u>Mistake</u>	
Within each crime risk (each Misdeed), specific crimes:	Risk = Possibility, Probability of event, Harm from event (or from its anticipation)
1.1.1.1. Detailed possibility of crime: specific crime type and/or perpetrator technique	Eg damage by <i>Wrecking</i> Repeat for each detailed possibility that applies
1.1.1.1.1. Details of Perp Technique/s and/or how crime unfolds	As far as possible based on research into Perpetrator techniques. Can extend into scripts and script clashes (concealment v surveillance etc)
1.1.1.1.2. Probability of crime	

1.1.1.1.2.1. Overall <i>magnitude of probability</i> [0/L/M/H]	[Zero/Low/Med/Hi]
1.1.1.1.2.2. <i>Magnitude depends on</i>	
1.1.1.1.2.2.1. <i>Design</i> of product – influences on probability of crime	As target, environment, enclosure. This may be a single product or a complex (as with bike+lock+stand) or a regularly-occurring configuration (eg stand in some regular geometrical relationship with a wall).
1.1.1.1.2.2.1.1.	Design influences – functional and/or technical expression. The design can have complicity which is criminogenic or criminally harmful; criminocclusive or mitigating criminal harm. Note that what is identified here are the obvious influences of susceptible or provocative properties, maybe explicit features or components. Less obvious design complicity will surface under context – for example, if the design makes it hard for the user to operate the lock securely. So this field is not the <i>limit</i> of what design can do to prevent crime, but the <i>starting point</i> . Consider scripts and script clashes as these relate to design – eg how far design of bike parking configuration favours offender’s ambush/surprise over user’s being on-guard – eg by distraction and facing-away when inserting money.

1.1.1.1.2.2.2. <i>Contextual</i> influences on probability of crime	<p><i>Contextual</i> influences on probability of crime based on CCO entities and agents other than the designed product. Even if that product is itself an environment, it will be located in a wider environment in its turn. These contextual influences may simply <i>add</i> to, or <i>interact</i> with properties of the product, e.g. visibility of product may add to lighting level in environment, to make product easier or harder to spot; or pattern on product will interact with pattern of background in environment to generate camouflage or contrast. Influences on agents (offenders, preventers, promoters) can be considered from 2 parallel perspectives – causal (eg engendering particular motivational or emotional states) and instrumental (relating to pursuit of goals to satisfy motives/consummate emotions, anticipation, decision etc). Note that even where contextual influences on crime have been identified, it may be possible to design around them – for example the possibility of negligent users acting as crime promoters by failure to properly operate the lock can be compensated for by designing an easier-to-use lock.</p>
1.1.1.1.2.2.2.1. Target	<p>This covers the eventuality where the target of crime acts as context for e.g. a designed environment. For example the environment could be misused to damage the target if it contained bricks that could be misused to smash the target. Where the target is the designed object, the environment is its context.</p>
1.1.1.1.2.2.2.2. Enclosure – motivating	<p>Eg provocative to offender; arousing/supporting territoriality in offender or preventer</p>
1.1.1.1.2.2.2.3. Environment – instrumental	<p>– wider accessibility eg via alleys, paths; surveillability from sightlines, lighting; favouring offender side of script clashes eg pursuit v escape</p>
1.1.1.1.2.2.2.4. Enclosure – instrumental	<p>limiting sightlines, accessibility</p>

1.1.1.1.2.2.2.4.1. Accessibility	These 4 headings apply to enclosure and to wider environment
1.1.1.1.2.2.2.4.2. Space – to undertake action	
1.1.1.1.2.2.2.4.3. Surveillability in immediate environment	<p>from sightlines/ lighting/ sound eg background noise level</p> <p>Surveillability could be with naked eye or aids such as mirrors or CCTV</p> <p>NB surveillance and general perception can be done by offender too – eg in having enough light to see lock</p>
1.1.1.1.2.2.2.4.4. Defensibility	People instrumentally helped to act as preventers in their own space or territory – eg advantage in surveillance, and script clashes such as pursuit/escape, surprise/alertness etc
1.1.1.1.2.2.2.5.Environment – motivating	Pressure, provocation, prompting, permission (Wortley’s ‘crime precipitators’). Motivating and disinhibiting side of environment, acting on offender readiness to commit crime; also acting on preventers eg via territoriality, distraction. Note that the environment can be designed to boost territoriality (a CPTED concept)
1.1.1.1.2.2.2.6.Enclosure – motivating	
1.1.1.1.2.2.2.7.Offender presence	Predisposed, ready, able offenders present/nearby/passing; planned v opportunist presence (connects with crime attractors and generators respectively); also with states (readiness) and predispositions (attitude to property; aggression)

1.1.1.1.2.2.2.8. Offender perception	And anticipation of risk, effort, reward, guilt, and associated decision-making. Affordance of utility of design in meeting offender needs/serving goals. More generally, what does offender need to see or hear in order to achieve positive goals (crime) and avoid negative ones (beaten up, arrested etc)?
1.1.1.1.2.2.2.9. Offender resources – brought	Resources best described in <i>functional</i> terms – eg a hammer means anything you can bash with, including a rock
1.1.1.1.2.2.2.10. Offender resources – locally found	
1.1.1.1.2.2.2.11. Promoter presence/perception/action or inaction	<p>their mere presence, motivation and resources (careless cyclists, negligent guards, fences)</p> <p>Note that careless/ignorant preventers are equivalent to promoters</p>
1.1.1.1.2.2.2.12. Preventer presence/perception/action – user	Preventers can be for example guards, managers, users, passers-by. Their mere presence may influence crime; also their motivation and resources to perceive and respond. More generally, preventers can be alerted, informed, motivated, empowered and directed to do the necessary tasks; their failure to be so can contribute to crime as above. How many potential preventers likely to be around during (various) hours of use? How alert, motivated, empowered, directed to notice crime or suspicious behaviour and take action?
1.1.1.1.2.2.2.13. Preventer resources – user	Eg knowledge of perp techs, security products inc locks; what to do on site to prevent; what to do if see a suspicious person/activity, a crime in progress, a crime happened – communications design?

1.1.1.1.2.2.2.14. Preventer presence/perception/action – passerby	
1.1.1.1.2.2.2.15. Preventer resources – passer-by	Knowledge of what to do/how to report crime in progress – communications design?
1.1.1.1.2.2.2.16. Preventer presence/perception/action – guard/manager	Effectiveness/efficiency of guard/manager depends on interactions with array of properties of product and its context – eg capacity of guard to do surveillance/surveillability of environment; capacity/motivation of manager to do maintenance/maintainability of facilities
1.1.1.1.2.2.2.17. Preventer resources – guard/manager	Eg knowledge of perpetrator techs, security products including locks; what to do on site to prevent; what to do if see a suspicious person/activity, a crime in progress, a crime happened – communications design, training, kit eg digital camera?
1.1.1.1.2.2.3. Wider opportunity structure	Markets, networks etc for crime
1.1.1.1.3. Harm from crime	Note there will be some harms from failed attempts at crimes – eg damage to products, anxiety for near-victim
1.1.1.1.3.1. Immediate harms mediated by <i>Design</i> of product	Immediate harms are those which happen to the designed object itself or perhaps to victims in the course of the criminal event
1.1.1.1.3.1.1.1. Criminal event: harm to product itself – product susceptible to:	Product is susceptible to being harmed in the listed ways – eg fracture
1.1.1.1.3.1.1.2. Post-event: harm from design of product	Eg fracture leaves jagged edge

1.1.1.1.3.2. Wider harms	Wider harms are knock-on consequences of the crime beyond the immediate designed object.
1.1.1.1.3.3. Contextual influences on wider harm	
1.1.1.1.3.4. Overall severity of harms [0/L/M/H/X] ?relative to all possible bike-related crimes, or to all crimes in general?	[Zero/Low/Med/Hi]

How the risk analysis procedure operates – in practice

The risk analysis procedure goes like this.

Every time a new design focus is considered, a new set of blank cells as shown above is dropped into the growing risk analysis table. Likewise, for that product, place or communication that is the current focus, every time a new crime possibility is identified the relevant cells of the table repeat. All this leads to a number of 'nested' repeats indicated by the hierarchical numbering. Alternatively these repeats could be considered as the branches of a tree, with the specific risks of specific kinds of criminal event as the final twigs, and the entries describing risk factors etc as leaves at the very tip.

In practice, it turned out to be easier to split the analysis task into two parts. The first was to tease out the **specific crime possibilities** relating to the current design focus, working from generic roles (CCO, light blue) to particular kinds of crime risk (M&S, yellow), to detailed kinds of criminal event (purple). Since there were many permutations of possibility, and many alternative variations on design focus, this involved some iteration in trading off the presentation of useful, distinguishing detail versus keeping the number of repeats of the template as small as possible. Only when the crime possibilities were satisfactorily organised was it sensible to proceed to the second part of the task, actually **filling in the details** (white, with design and context considerations in red text) under each specific criminal event category.

Both tasks fleshed out the CCO Dynamic framework by drawing on the following information:

- General knowledge of nature and range of crime
- Knowledge of bike crime perpetrator techniques
- Construction of typical designs
- Their likely environment of use (including range of roles present such as passers-by, guardians)

and modes of thinking:

- 'Thinking thief', thinking terrorist, thinking rowdy children or whoever, and imagining their motivations to steal, damage or protect, and the deployment of perpetrator techniques within the unfolding of scripts
- Envisaging the script clashes between the conflicting roles of offender, preventers and promoters

The crime possibilities considered in the full risk analysis are summarised in Tables 4-7 below. They cover the designed products or places in turn, as objects and in-function from a crime prevention point of view. Note that for space-saving purposes in these summary tables, unlike in the full risk analysis template (Table 3), the colour codes go horizontally across columns. Likewise, for clarity, the hierarchical numbers have been omitted.

The in-function risk analyses are intended to identify **how the security function can fail**. This can involve possibilities such as offenders' **countermoves** against secure designs and security procedures (such as limiting surveillance at night by wearing dark clothing). A positive statement of the intended security functions of each design focus is included in the next main section, where we move to the design guidance. Of course, anyone developing a risk analysis in this way will have to have these security functions in mind already.

Table 4 Risk analysis of possibilities – furniture as object

Design focus	Generic role in crime – CCO	Crime type – Misdeeds & Security	Specific crime – perpetrator technique
Furniture – stand, cluster of stands – as object	Increased crime risk <i>to</i> object – target	Mistreatment	Wrecking
			Defacement – ink, paint, sticker
			Defacement – scratching, abrasion
		Misappropriation	Stolen for resale or scrap
		Mishandling	Counterfeit for sale
		Mistake	False alarm if security sensors fitted
			Accidental damage mistaken for criminal tampering
	Increased crime risk <i>from</i> object – contributor as resource for offender	Misuse	Climbing aid for burglary or for escaping from pursuing police
			Deceptive placing of bomb
		Misbehaviour	Climbing onto, sitting on
			Bashing to make noise
		Mistake	False alarm of terrorist threat – suspicious object leaning/hanging on stand

Table 5 Risk analysis of possibilities – furniture in-function for crime prevention

Design focus	Generic role in crime – CCO	Crime type – Misdeeds & Security	Specific crime – perpetrator technique
Furniture – bike stand – in-function	Increased crime risk to bike and its components as target of crime	Mistreatment	Deliberate damage
		Misappropriation of entire bike for resale	Stolen by detaching bike from anchorage
			Stolen by cutting stand
			Stolen by breaking lock
			Stolen by picking lock (as affected by design of stand)
			Hijacking of bike at point of user locking or unlocking it
		Misappropriation of bike components and add-ons	Eg wheels or lights removed from bike
	Increased crime risk <i>from</i> bike – contributor as resource for offender	Misuse of bike in service of its own misappropriation	Bike frame used as lever to break lock
	Parking money as target of crime [if payment system built into stand]	Mishandling	Fraud with parking money
		Misappropriation with mistreatment of installation or users	Theft of money by breaking into coin-operated mechanism
			Robbing cyclist at point of parking
			Robbing cash collector
	Bike-lock-stand complex as environment of crime	Misbehaviour	Conflict with other user over parking – bike jam
			Conflict with pedestrian – blockage
			Conflict with pedestrian – collision/ cut-up

Table 6 Risk analysis of possibilities – enclosure/facility as object

Design focus	Generic role in crime – CCO	Crime type – Misdeeds & Security	Specific crime – perpetrator technique
Enclosure/facility – as object			
1. Periphery	Environment of crime	Not specified	Entire range against barrier, entry point, interior or contents of interior (described below)
2. Barrier	Target of crime	Mistreatment	Expressive – wrecking, defacement, cutting, abrasion
		Misappropriation	Theft of barrier material
	Resource for crime	Misuse	Concealment/entrapment – hiding behind/within barrier for escaping pursuit, avoiding surveillance, ambushing/trapping victim of robbery/assault, urination drug dealing/consumption etc
			As climbing aid for burglary/escape
			Deceptive placing of terrorist bombs
		Mistake	Bomb false alarm
3. Interior	Target of crime	Mistreatment	Expressive – wrecking, defacement, cutting, abrasion of interior fittings
		Misappropriation	Theft of interior equipment – removal, cutting off etc
	Environment of crime	Misappropriation/mistreatment of victims	Theft/ robbery of users in interior
		Misbehaviour	Collisions or jams lead to conflict and perhaps expressive violence and damage
			Littering
			Urination

Table 7 Risk analysis of possibilities – enclosure/facility in-function

Design focus	Generic role in crime – CCO	Crime type – Misdeeds & Security	Specific crime – perpetrator technique
Enclosure/ facility in-function			
	Enclosure -protecting contents of interior by enabling/delivering access control	Mishandling – entry (and exit) without justification or permission, in service of other crimes	People with no right to enter enclosure, climb over barrier or slip through entry point, perhaps defeating any ticket/payment mechanisms by fraudulent means. Escaping offenders climb or slip through in reverse
		Mistreatment in service of other crimes	Entry to enclosure gained by damaging barrier/entry control equipment
	Surveillance of interior	Mistreatment/mishandling in service of other crimes	Perpetrators damage or block surveillance function by obstructing sightlines, breaking lights or cameras


Orbit D: Full example risk analysis: furniture – bike stand – target of crime – mistreated – wrecking

Having filled in the ‘coloured’ **possibility** sections of the risk analysis template in the above summary tables, we can now expand those tables vertically and do the same for the ‘white’ sections covering the **probability and harm** associated with each of those possibilities, as per the worksheet in Table 3 above. This is illustrated horizontally taking the first row of **furniture as object** (Table 8, extracted from top line of Table 4) and then done in full vertical expansion below, with the hierarchical numbering (Table 9).

Table 8 Example row of one crime possibility extracted from summary Table 4

Design focus	Generic role in crime – CCO	Crime type – Misdeeds & Security	Specific crime – perpetrator technique
Furniture – stand, cluster of stands – as object	Increased crime risk to object - target	Mistreatment	Wrecking

Table 9 Example of full risk analysis of the crime possibility in Table 8

1.	Furniture – <i>individual stand or cluster – as object</i>
1.1.	Target of crime
1.1.1.	Damaged (Mistreated) by
1.1.1.1.	Wrecking
1.1.1.1.1.	Probability of crime
1.1.1.1.1.1.	Overall magnitude of probability 
1.1.1.1.1.2.	Magnitude depends on
1.1.1.1.1.2.1.	Design of product's influences on probability of crime
1.1.1.1.1.2.1.1.	Inherent visibility of product prompts attack
1.1.1.1.1.2.1.1.1.	Cluster may be a more obvious target set to offender
1.1.1.1.1.2.1.2.	Value of product to offender – rewarding to damage product – eg makes satisfying noise/shape
1.1.1.1.1.2.1.3.	Prompting and provocation by distinctive shape; by being an authority symbol (signs, notices, gates, barriers)
1.1.1.1.1.2.1.4.	Susceptibility to deformation, fracture, uprooting, jamming
1.1.1.1.1.2.2.	Contextual influences on probability of crime
1.1.1.1.1.2.2.1.	Target
1.1.1.1.1.2.2.1.1.	In a cluster, one stand may act as a point eg of leverage or brace in attacking another – strictly part of instrumental environment
1.1.1.1.1.2.2.2.	Environment – instrumental
1.1.1.1.1.2.2.2.1.	Accessibility – inc space for leverage surrounding <i>individual stand or cluster</i>
1.1.1.1.1.2.2.2.2.	Poor surveillability in immediate environment from sightlines/ lighting

....1.2.1. Cluster may affect sightlines eg if offender may be hidden if crouched down between stands
1.1.1.1.1.2.2.3. Defensibility – see also separate handling of enclosure under Facility below
1.1.1.1.1.2.2.3. Environment – motivating
1.1.1.1.1.2.2.3.1. Lack of legitimate entertainment supplies time and causes readiness to offend
1.1.1.1.1.2.2.3.2. Territory of preventer
1.1.1.1.1.2.2.4. Offender presence
1.1.1.1.1.2.2.4.1. Dislike of cyclists
1.1.1.1.1.2.2.4.2. Drunk/rowdy state
1.1.1.1.1.2.2.5. Offender perception
1.1.1.1.1.2.2.6. Offender resources – brought tools
1.1.1.1.1.2.2.6.1. Cutters, levers, spanners
1.1.1.1.1.2.2.7. Offender resources – locally found
1.1.1.1.1.2.2.7.1. Stones, levers eg scaffold poles
1.1.1.1.1.2.2.8. Promoter presence/action or inaction
1.1.1.1.1.2.2.8.1. Friends urging/supporting misbehaviour – pressure
1.1.1.1.1.2.2.8.2. Slow repair prompts fresh attack by sight of existing damage
1.1.1.1.1.2.2.8.3. Poor installation facilitates damage
1.1.1.1.1.2.2.9. Preventer presence/action – user
1.1.1.1.1.2.2.9.1. Affected by short/med/long stay
1.1.1.1.1.2.2.10. Preventer presence/perception/action – passer-by
1.1.1.1.1.2.2.11. Preventer resources – passer-by
1.1.1.1.1.2.2.12. Preventer presence/perception/action – guard/manager

1.1.1.1.2.2.13. Preventer resources – guard/manager
1.1.1.1.2.2.13.1. Visual/audio surveillance aids
1.1.1.1.2. Harm from crime
1.1.1.1.2.1. Immediate harms <i>mediated by</i>
1.1.1.1.2.1.1. <i>Design</i>
1.1.1.1.2.1.2. Harm to product itself during criminal event – susceptibility to:
1.1.1.1.2.1.2.1. Deformation of body or anchorage
1.1.1.1.2.1.2.2. Fracture of body or anchorage
1.1.1.1.2.1.2.3. Uprooting of anchorage
1.1.1.1.2.1.3. Post-event: harm from <i>design</i> of product
1.1.1.1.2.1.3.1. Sharp points or edges left
1.1.1.1.2.1.3.2. Trip hazard left
1.1.1.1.2.1.3.3. Uplifted/broken paving
1.1.1.1.2.2. Wider harms
1.1.1.1.2.2.1. Denial of use (impact on convenience, habitual decision to cycle...)
1.1.1.1.2.2.2. Cost and effort of repair/replacement
1.1.1.1.2.2.3. Injury from cutting or tripping
1.1.1.1.2.2.4. Incivility – generates general fear of crime
1.1.1.1.2.2.5. Incivility – generates specific perceived risk of damage/loss of bike, hence deters parking and use
1.1.1.1.2.2.6. Aesthetic degradation of site – environmental quality of life
1.1.1.1.2.2.7. <i>Contextual influences on wider harm</i>
1.1.1.1.2.2.7.1. Delay/difficulty in repair/replacement
1.1.1.1.2.2.7.2. Susceptible users of site (eg blind, elderly)

1.1.1.1.2.3. Overall *severity* of harms [M]

The complete risk analysis, crime possibility by crime possibility, is shown in Appendix 1. This covers furniture only, because the facilities equivalent was not recorded in risk format but entered directly into the design guidance format, as described next.

From risk analysis to design guidance

It was considered by those consulted in the Bikeoff team that the output of the risk analysis was valid; but that it was too detailed, repetitive and perhaps esoteric to show designers – the great majority – who might be using this material themselves without a thorough appreciation of the underlying principles. It was also felt that to present such users with dual discourses ('this is risk X; design needs to reduce risk X') was largely redundant. Finally, in order to be comparable with the output of WPA1 on 'Best of Breed' design experience, the CCO version had in any case to move on from analysis of risk to recommendation for design. So the decision was taken to make the main output a **simplified set of design guidance statements based on the risk analysis**.

This was done in two ways. First, where the risk analysis had already been written out, the design prescriptions were 'read off' the table and converted into design guidance language. The correspondence was like this:

1.1.1.1.1.2.1.2. Value of product to offender – rewarding to damage product – eg makes satisfying noise/shape

That entry in the risk analysis became part of this more inclusive statement in the design guidance:

1.1.2.3.1. Furniture should not stimulate deliberate damage (eg by appearing weak, provocative (as in authority symbol or pretentious 'arty' shape) or being rewarding to damage eg in terms of enjoyment of exercise of force, sight, shape or sound).

Second, where the analysis had not yet been completed, the author, with a little practice, was able to use the risk analysis template to focus on each risk element in turn in his head, and type it down directly in design language, in the design guidance template.

The development of the design guidance itself is described in the next section.

5. The design guidance – development

At the design guidance stage, it is again necessary to give separate treatment to the twin perspectives of **design as object** and **design in-function**.

Three qualifications follow. First, as said already, the function of **self-protection** makes more sense to locate under 'as object' above. Second, **Misuse** of designed product/place is normally covered under the 'as object' section, although **denial of misuse** could be seen as a security function. Third, any **harm from the preventive function itself** is taken to be an unintended consequence of the design (unless the design deliberately seeks to subject the offender to 30000 volts) so it is best covered under design 'as object'.

Design as object

The format for design as object is presented in Box 3 below. The format follows that for the risk analysis (Section 4 above) at least as far as the listing of detailed criminal events, and the same colour code is used. However, the numbering differs in the design guidance because the individual entries teased out in the risk analysis are, for the sake of simplicity and economy of space, more closely grouped together. (If each risk analysis were to be done in full and then followed by its corresponding design guidance, the same numbering could be used.)

Box 3 Format of design guidelines

- **Design focus – eg furniture as object**
 - **CCO entity – object as target of crime/ resource for crime/ environment of crime/ enclosure for crime**
 - Generic design requirements to reduce **probability** of undesired events
 - Furniture should be resistant to physical attack by ...
 - **Misdeed**
 - Details of **criminal events**
 - Offenders, motivation, perpetrator techniques, victims etc [plus link to harms]
 - General contextual risk factors increasing **probability** of undesired events
 - Proximity of bars and clubs
 - Design requirements to reduce **probability** of undesired events
 - Furniture should minimise susceptibility to ...
 - Design requirements to reduce **harm** from preventive measures themselves [Eg an annoying security barrier is inconvenient and may provoke retaliatory damage]
 - Furniture should...
 - Design requirements to reduce **harm** If event happens
 - Furniture should...

Several other considerations were taken into account when developing this format.

- The most elementary form of guidance would simply tell designers 'do this/ don't do that' without any crime prevention rationale. This would allow simple, brief communications with minimal duplication and may be suited to circumstances where designers are only in a position to take heed of a simple checklist. But it does have its limitations, centring on the fact that the designers would be slavishly following a recipe rather than empowered to use their focused imagination. (Writers of guidance need to focus on posing the correct questions, and not get too closely involved in supplying answers. The designers may think of something the guidance didn't. Also, the need for simultaneous design response to different crime types may lead to design conflicts; this is user and abusers-centred design.) So to support the 'think thief' approach but at the expense of some repetition, the version here maintains the separate listing of design recommendations for each individual set of crime possibilities.
- Another matter leading away from bald checklists is the **context-dependency** of crime prevention (not to mention the context-dependency of most other designed-in functions) emphasised in Section 2 above. So rather than simply set out design requirements as absolutes, it is necessary to bear in mind the **context**. This is handled by identifying **contextual risk factors** which influence the **probability** of, or **harm** from,

the relevant crime possibility. Obviously the more the risk factors or the greater their intensity, the more the requirement on design to mitigate them (and if not by design alone, then by human management/guardianship facilitated and assisted by design). Some of these risk factors are generic, others relate to specific design requirements and to avoid repetition are inserted at appropriately generic or specific levels in the guidance. The risk factors are described using CCO again, at appropriate places of greater and lesser generality.

- The environmental **context** that appears under **risk factors** relating to furniture, may simply be part of the natural milieu into which the furniture is installed – nearby walls, bus shelters etc. Alternatively, part of the environment can be deliberately hived off as a designed enclosure intended as a **security adaptation** which purposively manipulates many of those contextual risk factors to increase the security of the space within which the stands are sited. So what was **context** for the furniture becomes the **designed entity** when we move on to consider the enclosed facility. Note, however, that product and place designers may view their tasks from opposite starting points working from product to environment and vice-versa.

Design in-function

The in-function part of the design guidance begins with a statement of the various **intended security functions** of the designed object or place, together with a description of how they work. In the functional statement it draws on the ‘security’ counterparts of the misdeeds in the Misdeeds and Security framework:

- **Secured** against misappropriation
- **Safeguarded** against mistreatment
- **Shielded** against misuse
- **Supporting** enforcement, justice,/crime reduction, community safety
- **Scam-proofed** against mishandling – fraud, counterfeiting, smuggling;
- **‘S’ivilised** – environment resistant or repellent to misbehaviour and conducive to good behaviour
- **Slip-proofed** against mistakes

How the function is intended to work is described in terms of the **causal mechanisms of intervention**, a discourse introduced in Section 2 above.

Thus for example the bike stand, in-function,

Secures whole **bike** and its **major components** (eg wheels) against **theft** by **anchoring** them to environment, and either supporting a **discriminator** function on the anchorage (eg fixing point for a lock brought by user); providing one (captive locking function); or providing part of one (eg locking feature on stand designed to mate with counterpart locking feature on bike).

The full security function statement of the furniture is in Box 4.

Box 4 Full security function statement of furniture

Furniture – outdoor/industrial bike stand – in function

Intended security functions– reducing **probability** of criminal event/s; reducing and/or mitigating **harm** from immediate criminal event or wider consequences – **and their preventive mechanisms – how they work**

- Secures whole **bike** and **major components** (eg wheels) against **theft** by **anchoring** it to environment, and either supporting a **discriminator** function (eg lock brought by user); providing one (captive locking function); or providing part of one (eg feature on bike designed to mate with locking feature on stand).
- 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 **environments** and **cycle users** in vicinity of stand against **nuisance and conflict** by orderly **rationing of parking places** and by **regulating movement of multiple bikes in same space**.
- May enable the **secure obtaining of revenue** from parking facilities by transacting and storing cash or transacting card payment linked to locking and release of bike.
- May enable the **secure operation of bike rental schemes** as in e above.
- 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).
- **Self-protection** against attack, criminal countermoves aimed at disabling security function and misuse in furtherance of other crimes – all included under 1 above (furniture as object) – by **target-hardening/softening**, or by avoiding **provocation or prompting of attack**.

The equivalent for the parking facility is in Box 5. In this case, it is more efficient to list the mechanisms by which the security function is delivered together, rather than function by

Box 5 Full security function statement of parking facility

Intended security functions – reducing **probability** of criminal event/s; reducing and/or mitigating **harm** from immediate criminal event or wider consequences – **and how they work**

- Secures **bike and components** against **deliberate damage, theft**
- Secures **users and managers/guards** against **robbery** (users/cash collectors), and shelters them against **conflict**.
- Safeguards all **users, managers/guards, passers by, residents, businesses** etc against terrorist attack by deposition of bomb etc.
- Protects **stands** against **deliberate damage, theft, misuse and misbehaviour** (see Furniture as object above).
- Secures any **payment-collecting system** against theft.
- **Self-protection** against attack, criminal countermoves aimed at disabling security function and misuse in furtherance of other crimes – all included under Facility as object above.

Note that the enclosure can be intended as a **security adaptation** which purposively shapes the environment within which the stands are sited; which therefore deliberately controls the spatial and perhaps social context of the stands and hence manipulates many of the **risk factors** surrounding the stands, identified in Furniture as object and in-function above.

All of these functions are achieved through acting as a designed, enclosed micro-environment for bike stands and users approaching/employing them. They work in more detail by enabling/facilitating some or all of the following preventive mechanisms. Some of these mechanisms tip the **instrumental** balance in favour of preventers over offenders in the exercise of their scripts (eg surveillance v stealth), or by **motivating** or otherwise causally influencing one or other party: [should these be converted into safeguarding etc, where possible? But enclosed environment is too generic to cast into similar statement to furniture-in-function]

- **Controlling access** by offenders to interior space – technologically or by human staff
- **Mobilising (Alerting, Informing, Motivating, Empowering)** guards/managers/users/others to **control behaviour/ check people** entering or leaving interior
- **Limiting escape of criminal** on completion of crime, or of attempt
- Limiting **space and barriers for hiding**
- Limiting **space for undertaking criminal actions** (leverage etc).
- Defining limited interior space requiring **surveillance**
- Defining **expected actions/users** at access point and within interior, hence **clarifying suspicious behaviour and people** to improve **detection and challenge** performance for surveillers
- Defining interior space setting subject to **rules** for good behaviour
- Providing well-defined **stallions for surveillance** (natural or technological) within interior

function as in the furniture box above.

Designing against the risks of failure of the security functions to prevent crime

The final part of the guidance returns to the security of the designed product but this time covers how its design should protect its function. The format (Box 6) is largely the same as that for the self-protection of the product under design as object, above. The difference is that the criminal possibility protected against actually amounts to a potential **failure of the intended security function**. In practice, the function of the designed product is represented (in blue) as protecting some target, resource environment etc *other than itself*; the failure is represented as one of the Misdeeds (in yellow), and in more detail as specific types of event (in purple). Once again, **contextual risk factors** are noted and **design recommendations** (occasionally with their own contextual considerations) set out which support the security function by reducing probability and/or harm from the criminal events.

Box 6 Format of design guidance for security function of furniture

- **Protecting bike and its components as target of crime**
 - **Deliberate damage to bike/components as end in itself**
 - Details of criminal events
 - Bike **vandalised** probably for expressive reasons (entertainment, retaliation, dislike of cyclists) – by hand, or with brought or adventitious tools.
 - General contextual risk factors increasing **probability** of undesired events
 - Design or Contextual factors increasing **probability** of damage, theft, misuse of or misbehaviour with **furniture** as under Furniture as object
 - Design requirements to reduce **probability** of undesired events
 - Stand should be designed to protect bike and its components from any deliberate damage, eg by limiting: access, working space for abrasion, leverage etc, supply of leverage/bracing points or components such as locking arms which can be misused as tools. Bike itself should not be misusable as lever in its own destruction.
 - Stand should be designed likewise to prevent damage incidental to targeting/misusing furniture as under 1.

Repetition is kept to a minimum by using hyperlinks within the guidance.

6. The full design guidance

The complete design guidance based on CCO and M&S frameworks now follows, covering Furniture and Facilities, each treated first as object, and second in-function. Some specific points to note:

- To attempt to keep a lid on the number of design and crime contingencies in the list, some grouping together and hyperlinked cross referencing has been done. Therefore, as said, the hierarchical numbering in the design guidance doesn't correspond to that in the risk analysis.
- The very beginning of the guidance lists some **general contextual risk factors** for increasing probability or harm, which apply across all four of these perspectives. The more intense these are in a given locality, the more the designer should consider protecting the furniture (and the bikes that the stands receive) within a secure enclosure, and to allow for human guardianship on-site.
- There was some debate among the Bikeoff project team about the extent to which **harm** information should directly be incorporated within the guidance, or made available separately in linked documentation. As previously argued, information on harm can have two functions – **influencing design priorities**;²³ and **specifically guiding design** to reduce that criminal harm. In the current version, the emphasis is on the latter, and most of the harm information remains in the corresponding entries in the risk analysis where that was separately done. Within the guidance, further information on harm for both purposes could be incorporated in the (purple) entries supplying **details of specific crime risks**.
- The language of the guidance is kept as functional as possible, to maximise design freedom. More technical, and thus more constraining, versions could be produced for designers with a narrower scope and/or less innovative capacity.
- The technical terminology of CCO and M&S frameworks is less emphasised in the design guidance, to improve accessibility for designers for capacity **building** purposes. However, these frameworks still underlie the guidance and continue to be indicated by the colour code. For anyone using the frameworks for capacity **development** (in other words, for developing fresh sets of guidelines for products other than bike furniture or facilities), the more explicit use of the frameworks would be helpful.

²³ Obviously, if more harmful consequences follow from a given type of crime, reducing the risk of that crime gets greater priority relative to other design requirements. The total harm could be reduced either by reducing probability of events, or directly reducing harm if the crime still does occur. More generally this links to the discussion of primary, secondary and tertiary security in Section 2.)

- Finally, although the above points on language may suggest otherwise, note that the current guidance material has not yet been formatted or fully drafted in a way that is 'ready to use' for designers or for developers of design guidance outside the current project team. Rather, it is primarily intended to generate the CCO-based guidance considerations that can be compared with those of WP A1, Best of Breed. Because different sets of designers may have different perspectives (eg product designers focusing on furniture/stands, architectural/building designers on facilities/enclosures), in a user-friendly guidance format the same crime possibility could be covered under both headings, with different emphases. For example 'robbery of cash collectors' could come under both furniture (if the money was taken, stored and collected stand by stand) and facility (if a common cash machine serving whole facility; but also if any boundary, access control and interior environment of an enclosed facility had contextual design implications for risks of individual cash machines).

Full design guidance

0. General contextual risk factors

0.1. Factors increasing the **probability of undesired events for all design foci**

- 0.1.1. Furniture/facility in environments which are easily accessible; where surveillance possibilities (in terms of lighting, sightlines) favour offenders (spotting targets, assessing risks and keeping a look out) over guards and other potential preventers.
- 0.1.2. Lighting conditions which facilitate offender actions (eg can see to select target, operate tools etc without exposure to risk by requirement to use a torch).
- 0.1.3. Presence (resident, working, routinely passing through) of potential offenders.
- 0.1.4. Absence of motivation and environmental conditions for exercise of informal prevention, including territoriality; and of social cohesion more generally.
- 0.1.5. Specifically, tendency among local users to adopt insecure locking practices.
- 0.1.6. Mutual anonymity of people present/passing through.
- 0.1.7. Plausibility of presence/actions of offenders as legitimate – eg disguise/props as council workers is credible in this location.
- 0.1.8. Absence of formal guardianship; guardians inadequately trained/equipped to surveill, challenge, respond, summon assistance.
- 0.1.9. Presence of general indicators of neglect/indifference to crime and misbehaviour (eg litter, poor maintenance).
- 0.1.10. Infrequent use and/or long parking times.
- 0.1.11. Presence of high-value bikes.
- 0.1.12. Presence of cash-operated facilities or furniture.
- 0.1.13. Construction of furniture/facilities of high-value materials.

0.2. Generic design implications of these risk factors

- 0.2.1. The more, and the more intense, these risk factors, the more it may be appropriate to raise the specification of detailed security properties, as listed in the remainder of this guidance.
- 0.2.2. In addition, it may become cost-effective to protect the parking facility within an enclosure (either indoor or outdoor), to have on-site or telepresent guards, and to design the furniture and facility to support the carrying out of their duties (for example with reference to access control and surveillance).
- 0.2.3. It is better to avoid designing cash into the system at all; but if this nonetheless proves necessary, various guidelines are suggested at appropriate points below.

0.3. Factors increasing the **harm from undesired events for all design foci**

- 0.3.1. Vulnerable street users present eg blind, elderly.
 - 0.3.1.1. Design implication – increase attention to the various harms listed below.
- 0.3.2. Inspection and maintenance is infrequent and/or limited.

- 0.3.2.1. Design implication – reduce costs and/or difficulty of inspecting and maintaining furniture and facilities (eg increase tamper-evident properties).

1. Furniture – outdoor/industrial bike stand – as object

1.1. As target of crime

1.1.1. Generic design requirements to reduce **probability** of undesired events

- 1.1.1.1. Configuration/orientation of **cluster** of furniture should be designed to minimise concealment of offender from surveillance, especially if crouching; and maximise view from any intended surveillance outlooks (by eye or camera as appropriate).

1.1.2. *Deliberate damage as end in itself*

1.1.2.1. Details of criminal events

- 1.1.2.1.1. **Wrecking** leading to deformation, fracture, uprooting; **defacement** by ink, spray paint, sticker; **cutting, abrasion** using range of brought and adventitious tools. **Burning**. Mechanisms with hinges, slots, interior works etc may be **blocked**, jammed or even glued or filled with noxious substances [I once encountered this service record in Tyne & Wear Metro: 'Dog dung in public enquiry telephone mouthpiece'] Usually by children/young people for play or occasionally retaliation against officials/users. Damage may also occur out of frustration with failing or awkward mechanism. [Note that the intentional act of doing damage is the criminal event; the immediate harmful consequence to the furniture is the damage achieved]

1.1.2.2. General contextual risk factors increasing **probability** of undesired events

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

1.1.2.3. Design requirements to reduce **probability** of undesired events

- 1.1.2.3.1. Furniture should not stimulate deliberate damage (eg by appearing weak, provocative (as in authority symbol or 'arty' shape) or being rewarding to damage eg in terms of enjoyment of exercise of force, sight, shape or sound).
- 1.1.2.3.2. Any mechanism (eg locking, money operations) 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').
- 1.1.2.3.3. 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 for wrecking: proximity to supplies of adventitious implements or bracing/leverage points.*
- 1.1.2.3.4. Furniture in clusters should not provide leverage/bracing sites to apply force to their neighbours.
- 1.1.2.3.5. Consider all users of the space to minimise likelihood that non-cyclists will become hostile to furniture.

- 1.1.2.3.6. Furniture should activate surveillance by calling attention to damage in progress (eg by requirement for conspicuous movement to achieve damage, inherent noise, or electronic alarm if appropriate).

1.1.2.4. Design requirements to reduce **harm** If event happens

- 1.1.2.4.1. It should 'fail safe' (eg not leave harmful sharp edges, trip hazards or electrical hazards). *Risk factor:* particularly if vulnerable or unwary street users present eg blind, elderly, children.
- 1.1.2.4.2. It should not destroy ground anchorage.
- 1.1.2.4.3. Damage should not propagate – eg scratches leading to rusting. *Risk factor:* Damp or exposed locations.
- 1.1.2.4.4. Damage to any parked bikes should be minimised.
- 1.1.2.4.5. Functional damage should be tamper-evident (so user doesn't try to park at a now ineffective stand eg which no longer locks properly, or where retaining rail becomes detached at one end).
- 1.1.2.4.6. Visual impact on environmental quality should be minimised. *Risk factor:* particularly if in environmentally important/salient site; or where local people likely to be especially fearful of crime.
- 1.1.2.4.7. Visual prompting of commission of further damage should be minimised (eg contrasting undercoat exposed by scratching).
- 1.1.2.4.8. Effort and cost to clean/repair/replace damage should be minimised.
- 1.1.2.4.9. Down-time when unavailable for use should be minimised.
- 1.1.2.4.10. Cleaning (eg paint removal) should not degrade the furniture (eg affect visual appearance, water resistance) *Risk factor:* furniture sited in exposed/wet location.

1.1.3. **Theft of furniture**

1.1.3.1. Details of criminal events

- 1.1.3.1.1. Usually adult offenders (maybe professional/organised) **stealing furniture or its components for resale or scrap value**. Furniture cut, detached, unfastened and removed, maybe requiring vehicle.

1.1.3.2. Contextual risk factors increasing **probability** of undesired events

- 1.1.3.2.1. Space for cutting, levering, striking
- 1.1.3.2.2. Inadequate installation facilitating removal
- 1.1.3.2.3. Vehicular access close by
- 1.1.3.2.4. Possibly more organised offending – co-offenders and good tools needed
- 1.1.3.2.5. Market value of furniture or scrap – will this rise over product lifetime?
- 1.1.3.2.6. Presence in district of fences and other crime promoters

1.1.3.3. Design requirements to reduce **probability** of undesired events

- 1.1.3.3.1. Furniture or easily-removed components should not be made of high-value and/or easily reprocessed materials

- 1.1.3.3.2. Furniture should not visually prompt theft (eg by obvious construction from high-value materials)
- 1.1.3.3.3. If resale a risk, furniture could have ineradicable identification (and registration). This should be made obvious to potential thief by a discouraging communication on or near the item.
- 1.1.3.3.4. Cutting or disconnecting furniture or components by readily available hand tools should be difficult, time-consuming, noisy and visually obvious, whether through choice of materials or configuration of stand.
- 1.1.3.3.5. Anchorage should be resistant to illegitimate release but easy for legitimate release (eg for replacement) – eg via requirement for specialist tools.
- 1.1.3.3.6. Secure installation of anchorage in ground, and ongoing inspection/maintenance of anchorage, should be easy.
- 1.1.3.4. Design requirements to reduce **harm** If event happens
 - 1.1.3.4.1. Same requirements apply as for Damage (1.1.2.4.).
 - 1.1.3.4.2. Furniture or expensive components should be identifiable in resale or scrap.
 - 1.1.3.4.3. Removed furniture should not be suitable for misuse as weapon eg in riot or tool eg to smash shop windows. *Risk factor: sited close to shops.*

1.2. As resource for crime

1.2.1. **Misuse of furniture as climbing aid** – whether as individual stand or a cluster

1.2.1.1. Details of criminal events

- 1.2.1.1.1. To gain access eg for burglary, or to escape pursuing police, offender climbs onto furniture and over wall, into window etc; or climbs down onto furniture to reach ground.

1.2.1.2. Contextual risk factors increasing **probability** of undesired events

- 1.2.1.2.1. Placement where climbing could facilitate illegal access or escape – eg near wall giving access to back garden

1.2.1.3. Design requirements to reduce **probability** of undesired events

- 1.2.1.3.1. Strength for stepping on, grippability, nonslippability, and configuration for climbing up and down should be minimised whilst not jeopardising normal function and appearance.
- 1.2.1.3.2. Perceived climbability (affordance) should be minimised.

1.2.1.4. Design requirements to reduce **harm** If event happens

- 1.2.1.4.1. It should resist damage from force or abrasion (although **harm** reduction may trade-off against **probability** of misuse); target-softening techniques such as spring-back may enable resistance to damage and to misuse to be co-maximised.
- 1.2.1.4.2. It should not be deliberately designed to punish or expose offenders to physical hazard.
- 1.2.1.4.3. Damage to any parked bikes should be minimised.

1.2.2. **Misuse of furniture for deceptive placing of bombs**

1.2.2.1. Details of criminal events

1.2.2.1.1. Offender hangs/leans bomb in bag or container against or on furniture.

1.2.2.2. Contextual risk factors increasing **probability** of undesired events

1.2.2.2.1. Local tensions which may motivate local terrorism

1.2.2.2.2. Crowded place, many human/material targets, places of particular value to terrorists.

1.2.2.2.3. Place where hostile reconnaissance is easy – see generic risk factors under [0](#).

1.2.2.2.4. Litter, waste acting as camouflage.

1.2.2.3. Design requirements to reduce **probability** of undesired events

1.2.2.3.1. Possibility to hang, lean or conceal explosives container/bag on stand (or in any closable/lockable container for cycling kit) should be minimised.

1.2.2.4. Design requirements to reduce **harm** if event happens (bomb detonates)

1.2.2.4.1. Possible weaponisation of stand – eg creating shrapnel – should be minimised

1.2.2.4.2. Proximity of people/places which can be **harmed**/damaged (as in [1.2.2.2](#)) [note that these **harm** factors also appear under **probability** factors, because the ability to achieve the **harm** is what motivates the offenders] *Risk factor: accessibility for emergency services.*

1.2.3. **Mistake – false alarm if furniture used to place items resembling bombs**

1.2.3.1. Details of criminal events

1.2.3.1.1. Not a crime but some person mistakenly perceives innocent bag or container hanging/leant against furniture as possible bomb.

1.2.3.2. Contextual risk factors increasing **probability** of undesired events

1.2.3.2.1. Same as for genuine event under [1.1.2.2](#).

1.2.3.3. Design requirements to reduce **probability** of undesired events

1.2.3.3.1. Possibility to hang or lean bag on stand, which might contain explosives, should be minimised.

1.2.4. **Misbehaviour – sitting/climbing on stands** – individual or clusters.

1.2.4.1. Details of criminal events

1.2.4.1.1. Children and young people (possibly intoxicated) *sit/climb on stands* and more generally gather round them, causing nuisance/fear and possibly wrecking/abrasion damage.

1.2.4.2. General contextual risk factors increasing **probability** of undesired events

1.2.4.2.1. As under Damage [1.1.2.2](#).

1.2.4.3. General contextual risk factors increasing **harm** from undesired events

1.2.4.3.1. Presence of people (eg elderly, minorities) who might feel particularly threatened by presence of groups of misbehaving youths

- 1.2.4.3.2. Crime propagation – if hanging around generates opportunity eg for casing shops, houses etc for burglary/theft; or becomes a place of conflict between rival groups (even a contested territory).
- 1.2.4.4. Design requirements to reduce **probability** of undesired events
 - 1.2.4.4.1. Climb-on/sit-on-ability of furniture should be minimised, eg in terms of strength, slipperiness, secure and comfortable configuration
 - 1.2.4.4.2. Affordance and invitation to climb/sit on should be minimised, eg in terms of appearance resembling familiar playground climbing frames or parallel bars in gym.
- 1.2.4.5. Design requirements to reduce **harm** If event happens
 - 1.2.4.5.1. See Damage [1.1.2.4](#)
 - 1.2.4.5.2. Climbers should not be exposed to ‘unacceptable’ or deliberately punitive additional risk eg furniture unexpectedly tips them off. *Risk factor: nature of ground to fall on.*

1.2.5. **Misbehaviour** – **bashing furniture to make noise**

- 1.2.5.1. Details of criminal events
 - 1.2.5.1.1. Young/child offenders/drunks use sticks/stones etc to create noise motivated by play, retaliation against elderly resident tellers-off etc
- 1.2.5.2. General contextual risk factors increasing **probability** of undesired events
 - 1.2.5.2.1. Acoustics of environment or enclosure.
 - 1.2.5.2.2. Background noise levels.
 - 1.2.5.2.3. Presence of people the offenders want to annoy.
 - 1.2.5.2.4. Availability of items to bash with.
- 1.2.5.3. Design requirements to reduce **probability** of undesired events
 - 1.2.5.3.1. Furniture/anchorage should not generate especially rewarding sounds when struck by hand/foot or with adventitious tools (sticks, stones etc).
- 1.2.5.4. Design requirements to reduce **harm** If event happens
 - 1.2.5.4.1. See damage [1.1.2.2](#), eg resistance to wrecking, abrasion [note that here, damage is a harmful consequence of the theft event, so what made events *probable* under *deliberate damage* now becomes what generates *harm* under *damage in course of theft*] and [1.1.2.4](#).
 - 1.2.5.4.2. *Risk factor: presence of people (residents, shopkeepers, workers) susceptible to being annoyed.*

2. Furniture – outdoor/industrial bike stand – in function

Intended security functions– reducing **probability** of criminal event/s; reducing and/or mitigating **harm** from immediate criminal event or wider consequences – **and their preventive mechanisms – how they work**

- a) Secures whole **bike** and **major components** (eg wheels) against **theft** by **anchoring** it to environment, and either supporting a **discriminator** function (eg lock brought by user); providing one (captive locking function); or providing part of one (eg feature on bike designed to mate with locking feature on stand).
- b) 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**.
- c) May shelter **environments and pedestrian/cycle users** in vicinity of stand against **nuisance and conflict** by keeping bikes out of way of pedestrian paths
- d) May shelter **environments and cycle users** in vicinity of stand against **nuisance and conflict** by orderly **rationing of parking places** and by **regulating movement of multiple bikes in same space**.
- e) May enable the **secure acquisition of revenue** from parking facilities by transacting and storing cash or transacting card payment linked to locking and release of bike.
- f) May enable the **secure operation of bike rental schemes** as in e above.
- g) 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).
- h) **Self-protection** against attack, criminal countermeasures aimed at disabling security function and misuse in furtherance of other crimes – all included under **1** above (furniture as object) – by **target-hardening/softening**, or by avoiding **provocation or prompting of attack**.

Notes

- The bike + lock + stand are treated here as a single complex.
- The lock and/or fastenings can be brought by the user, or present as components of the stand.
- The user should be considered part of the system operating the complex, although mostly treated below as context.

2.1. Protecting bike and its components as target of crime

2.1.1. Deliberate damage to bike/components as end in itself

2.1.1.1. Details of criminal events

- 2.1.1.1.1. Bike **vandalised** probably for expressive reasons (entertainment, retaliation for obstruction, dislike of cyclists) – by hand, or with brought or adventitious tools. [Note – incidental damage to bikes in course of misuse or theft of bike stand is covered in **1.1** stand as target of crime]

2.1.1.2. General contextual risk factors increasing **probability** of undesired events

- 2.1.1.2.1. Design or Contextual factors increasing **probability** of damage, theft, misuse or misbehaviour with **furniture** as under **1**.

2.1.1.3. Design requirements to reduce **probability** of undesired events

- 2.1.1.3.1. Stand should be designed to protect bike and its components from any deliberate damage, eg by limiting: access, working space for abrasion, leverage etc, supply of

leverage/bracing points or components such as locking arms which can be misused as tools. Bike itself should not be misusable as lever in its own destruction.

- 2.1.1.3.2. Stand should be designed likewise to prevent damage incidental to targeting/misusing furniture as under 1.

2.1.2. **Theft of bike or components from stand** – all techniques of theft

2.1.2.1. Details of criminal events

- 2.1.2.1.1. Bike removed from stand eg by detaching anchorage of stand, cutting stand, breaking or picking lock, coercing user. Detachable components removed, forced or cut from bike.²⁴

2.1.2.2. General contextual risk factors increasing **probability** of undesired events

- 2.1.2.2.1. Significant presence of potential thieves routinely passing, or specifically attracted to, site.
- 2.1.2.2.2. Site within catchment area of market for stolen bikes.
- 2.1.2.2.3. Site likely to contain high-value bikes worth stealing for permanent possession/resale; or presence of significant number of offenders who would value 'get-me-home' bikes of any quality. Value of bikes is readily visible.
- 2.1.2.2.4. Limited use of marking/registration or tracking schemes in area
- 2.1.2.2.5. Managers/maintenance staff unaware of this perpetrator technique hence unlikely to repair/tighten fittings.

2.1.2.3. Generic design requirements to reduce **probability** of undesired events

- 2.1.2.3.1. Degree to which value of bikes can easily be seen without close inspection should be minimised.

2.1.3. **Theft of bike from stand – Detaching stand from anchorage; cutting stand**

2.1.3.1. Details of criminal events

- 2.1.3.1.1. Offender unbolts stand; cuts retaining fixings; digs out foundation; and either removes bike there & then or pre-loosens stand, to return when desirable bike present and unguarded. Alternatively, offender part cuts through stand and removes or bends section aside again for present or future removal of bike. Tools may include saws, cutting disks, spanners, socket wrenches, levers (which could be adventitious).

2.1.3.2. Design requirements to reduce **probability** of undesired events

- 2.1.3.2.1. Fixings, foundation and anchorage should be resistant to detachment or working loose.
- 2.1.3.2.2. Stand should be resistant to cutting and then bending, especially in sections which would enable bike to be removed.

²⁴ These actions are a little differently expressed from the standard Bikeoff Perpetrator Techniques list of 'striking, picking, levering, cutting, lifting and unbolting.' It was felt that these 'pure actions' were adequate for summary labels but for design guidance purposes contained insufficient detail of what received the action (the stand, the lock, the bike etc). Also, one or two action possibilities listed here (such as coercive hijacking) were new.

- 2.1.3.2.3. Stand and anchorage should *appear* robust against these actions, discouraging offenders from even trying and thereby causing damage even in failed attempts.
- 2.1.3.2.4. Any detachment/cutting should be tamper-evident to users and/or any guards/managers. If necessary consider communications to alert, inform and empower users to take note.
- 2.1.3.2.5. Maintenance and repair of anchorage (eg tightening if loose) should be easy to spot the need and to undertake.
- 2.1.3.2.6. Actions to detach or cut stand (unbolting, working loose or cutting) should be obvious in sound, sight of movement and intent
- 2.1.3.2.7. Unbolting etc should require specialist tools and should be difficult with likely hand tools brought by offenders or acquired adventitiously nearby.
- 2.1.3.2.8. Subject to requirement for legitimate use, and maintenance/ replacement, access and space to undertake the detachment or cutting actions should be constrained.
- 2.1.3.2.9. If stand + bike + lock detached from anchorage, bike + lock should not be easily removable (eg by sliding off free end) from loose remains of stand, but should remain attached as an encumbrance (discouragement through increased effort required for further separation) and a deterrent (offender's perceived risk of detection).

2.1.3.3. Design requirements to reduce **harm** If event happens

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

2.1.4. **Theft of bike from stand – breaking, picking or electronically defeating lock**

Lock/s may be captive or supplied by user.

2.1.4.1. Details of criminal events

- 2.1.4.1.1. Offender uses force (perhaps with brought or adventitious tools eg chisel, drill, hammer, stick, bike frame) to break/release lock mechanism or cut retaining cable/bar; fine tool (pick lock, paperclip or whatever) or electronics as appropriate to circumvent the discriminatory property of the lock; or both in combination. More than one lock, of different kinds, may need to be defeated.

2.1.4.2. General contextual risk factors increasing **probability** of undesired events

- 2.1.4.2.1. **Space within cluster of stands, wider environment or enclosure to undertake action – apply tools.**

2.1.4.3. Design requirements to reduce **probability** of undesired events

- 2.1.4.3.1. Reduce susceptibility of any captive lock to levering, hammering, drilling, prising or cutting – by hardening material or construction; or softening (eg making bars swivel so sawing force can't be applied).
- 2.1.4.3.2. Reduce susceptibility of lock to picking, requiring time, specialist tools, good light, skills and concentration.

- 2.1.4.3.3. Lock and bars etc should appear robust against these actions, discouraging offenders from even trying and thereby causing damage even in failed attempts.
- 2.1.4.3.4. Any breaking/picking should be tamper-evident to users and/or any guards/managers/maintenance staff. If necessary consider communications to alert, inform and empower users to take note; and data link to staff.
- 2.1.4.3.5. Maintenance and repair of captive lock/bars/cables etc should be easy to spot the need and to undertake.
- 2.1.4.3.6. Actions to break/pick lock should be obvious in sound, sight of movement and intent
- 2.1.4.3.7. Ensure any 'engineer's back door' on captive lock – to facilitate unlocking of broken lock or in case of lost key/code – is not susceptible to exploitation. *Risk factor: low level of security among maintenance employees.*
- 2.1.4.3.8. Ensure configuration of components does not facilitate one part being used to supply leverage, or brace, against another. This includes bike frame used as lever to snap lock or lock cable/chain/bar. Likewise ensure lock cable/chain/bar (captive or otherwise) is not able to be brought too near any nearby ground, wall etc so it can be braced against force.
- 2.1.4.3.9. Ensure user applying own lock fits it in secure position.
- 2.1.4.3.10. Locking mechanism easily/cheaply replaceable/upgradeable if offenders discover how to overcome it, obtain master keys etc.
- 2.1.4.4. Design requirements to reduce **harm** if event happens
 - 2.1.4.4.1. As under Damage to furniture 1.1.2.4. (not all apply).

2.1.5. *Theft of bike from stand – bike removed from improperly activated captive lock*

- 2.1.5.1. Details of criminal events
 - 2.1.5.1.1. User thinks that lock has activated; offender discovers, or has pre-arranged (eg with an object placed within locking mechanism), that it has not.
- 2.1.5.2. General contextual risk factors increasing **probability** of undesired events
 - 2.1.5.2.1. User in a hurry (eg commuter station)
 - 2.1.5.2.2. Poor lighting or other distractions (noise, crowding) inhibit checking of lock
 - 2.1.5.2.3. User unaware of risk
 - 2.1.5.2.4. Infrequent maintenance/inspection
 - 2.1.5.2.5. Maintenance staff unaware of perpetrator technique
- 2.1.5.3. Design requirements to reduce **probability** of undesired events
 - 2.1.5.3.1. Lock easily and reliably activated.
 - 2.1.5.3.2. Lock gives clear visual/audio feedback when activated.
 - 2.1.5.3.3. Lock resistant and/or tamper evident to 'spiking' (or whatever it's called).
 - 2.1.5.3.4. Communication about risk to user perhaps incorporated ruggedly in lock, stand or separate signage.
- 2.1.5.4. Design requirements to reduce **harm** if event happens
 - 2.1.5.4.1. Damage to or from any loosely-flapping lock arm/bar should be minimised.

- 2.1.5.4.2. In high-risk contexts where data link already available, remote sensing of failed lock actuation may be appropriate, eg notifying guard/manager/maintenance staff.

2.1.6. *Theft of components from bike in stand*

2.1.6.1. Details of criminal events

- 2.1.6.1.1. Wheels, saddle, mudguards etc removed, leaving bike frame in place; frame removed leaving wheel in place; unsecured items eg pumps, lights removed.

2.1.6.2. General contextual risk factors increasing **probability** of undesired events

- 2.1.6.2.1. User leaves kit behind carelessly or ignorantly.
- 2.1.6.2.2. Valuable items available/ in fashion hence desirable and constituting a marketable commodity.
- 2.1.6.2.3. Nowhere to take/store items off-site
- 2.1.6.2.4. Bikes with easily removable components

2.1.6.3. Design requirements to reduce **probability** of undesired events

- 2.1.6.3.1. Consider scope for stand to protect removables (by static shape or barrier or anchorage afforded by any captive locking components)
- 2.1.6.3.2. Consider scope for stand design to lead the user to lock-on major components especially wheels.
- 2.1.6.3.3. Consider scope for inbuilt secure container for small items eg lamps; but equally consider risk of this becoming in its turn a target for breaking in, or a resource for terrorist bomber, drug dealer etc.
- 2.1.6.3.4. Communication about risk to user perhaps incorporated ruggedly in lock, stand or separate signage.

2.1.6.4. Design requirements to reduce **harm** if event happens

- 2.1.6.4.1. Ensure wheel-less frames/vice-versa do not pose an injury risk to users/ passers-by or damage other bikes parked alongside.
- 2.1.6.4.2. Ensure carcasses are easily removable by maintenance staff to minimise 'broken bike' syndrome and impact on aesthetics/fear (but beware exploitation of 'back door' susceptibility by thieves).

2.2. *Protecting parking money as target of crime*

2.2.1. Generic design requirements to reduce **probability** of undesired events

- 2.2.1.1. Consider cash-free systems eg based on cards or tokens

2.2.2. *Theft of cash from machine*

2.2.2.1. Details of criminal events

- 2.2.2.1.1. Breaking into cash box by prising, cutting, striking, drilling etc

2.2.2.2. General contextual risk factors increasing **probability** of undesired events

- 2.2.2.2.1. Infrequent collection allows cash to build up.

- 2.2.2.2.2. Susceptibilities of cash box and infrequent collection become known among circle of offenders (a particular problem if design is standardised and widespread).
- 2.2.2.2.3. Local thieves motivated to take petty cash – eg if feeding drugs habit is widespread.
- 2.2.2.2.4. Bike stands not surveilled, or in enclosure.
- 2.2.2.2.5. Guards unalerted and uninformed about risk.
- 2.2.2.2.6. Space to apply tools to cash box.

2.2.2.3. Design requirements to reduce **probability** of undesired events

- 2.2.2.3.1. Cash box should be robust (target hardening/softening) against known perpetrator techniques and available hand tools. *Risk factor: If close to vehicle access, heavier tools may be brought.*
- 2.2.2.3.2. Cash box should look robust, to deter and discourage thieves.
- 2.2.2.3.3. Cash box component of bike stand should not be concealed from view of managers/ guards/ legitimate users/ passers-by, by body of thief, bike or other components of stand.
- 2.2.2.3.4. Action to break cash box should be obvious visually, aurally and in terms of intention.
- 2.2.2.3.5. Consider alarm system in high-risk circumstances.

2.2.2.4. Design requirements to reduce **harm** If event happens

- 2.2.2.4.1. See [2.1.5](#) – broken cash box could increase risk of theft of bike if lock mechanism affected – so tamper evident design required.
- 2.2.2.4.2. Fail-safe against injury risk – see [1.1.2.4](#).

2.3. Protecting parking money as target of crime, parking area as environment of crime

2.3.1. Robbery of cash collectors

2.3.1.1. Details of criminal events

- 2.3.1.1.1. Thief/thieves ambush cash collector in vicinity of bike stand/s and force them to hand over money

2.3.1.2. General contextual risk factors increasing **probability** of undesired events

- 2.3.1.2.1. Absence of safe cash handling practices.
- 2.3.1.2.2. Environment and any enclosure (including bike parking enclosure) provide for waiting offender's concealment – in terms of sight lines, lighting; or give excuse for offender to loiter for apparently innocent reason.
- 2.3.1.2.3. Environment/ enclosure allow sudden approach of offender, and easy escape/disappearance.
- 2.3.1.2.4. Robbery of all kinds is frequent in vicinity.

2.3.1.3. Design requirements to reduce **probability** of undesired events

- 2.3.1.3.1. Cash box emptying action should not require employee to turn back on possible danger.
- 2.3.1.3.2. Cash box emptying action should be swift and fumble-free.

2.3.1.4. Design requirements to reduce **harm** If event happens

- 2.3.1.4.1. Cash box design should allow cash-collecting employee to surrender box if threatened.
- 2.3.1.4.2. If employee is pushed or falls, minimise protruding elements or sharp edges on which they could be injured.

2.4. **Protecting user's person/money/property as target of crime – cluster of stands as environment**

2.4.1. **Robbery of user at point of parking/unparking**

2.4.1.1. Details of criminal events

- 2.4.1.1.1. Whilst user distracted by task of seeking a stand or parking/unparking, and perhaps getting out wallet or opening bag to extract cash or card for payment, thief ambushes/snatches, and/or threatens user to hand over money, wallet, bag, phone etc

2.4.1.2. General contextual risk factors increasing **probability** of undesired events

- 2.4.1.2.1. As per robbery of cash collectors [2.3.1.2](#)

2.4.1.3. Design requirements to reduce **probability** of undesired events

- 2.4.1.3.1. Cash payment action (whether pay on arrive or pay on leave) should not require user to turn back on possible danger.
- 2.4.1.3.2. Cash payment action should be swift and fumble-free.
- 2.4.1.3.3. Any payment card should not be transferable.
- 2.4.1.3.4. Payment instructions should be easy for user to take in and should not distract them over-long.

2.4.1.4. Design requirements to reduce **harm** If event happens

- 2.4.1.4.1. Configuration of cluster of stands should not trap victim and offender together in confined space.
- 2.4.1.4.2. If user is pushed or falls, minimise protruding elements or sharp edges on which they could be injured. Consider the stand in configuration with kerbstones, walls, windows etc if possible.
- 2.4.1.4.3. *Risk factors: elderly users more vulnerable to injury and less resilient to trauma.*

2.5. **Protecting cluster of stands as environment of crime**

2.5.1. **Misbehaviour – conflict between cyclist and pedestrian**

2.5.1.1. Details of criminal events

- 2.5.1.1.1. Cyclist approaching/leaving cycle stand or cluster of stands, collides (whilst pushing or pedaling) with pedestrian, or one block's other's path; may lead directly to injury or to verbal or physical aggression.

2.5.1.2. General contextual risk factors increasing **probability** of undesired events

- 2.5.1.2.1. Environment – channels different street users into same space/paths.
- 2.5.1.2.2. Crowded environment – perhaps at particular times.

- 2.5.1.2.3. Close to drinking/entertainment areas.
- 2.5.1.2.4. Area associated with aggressive subculture; presence of long-standing conflicts – eg between different groups of young people (including schools), old v young.

2.5.1.3. Design requirements to reduce **probability** of undesired events

- 2.5.1.3.1. Clear pavement markings/ signage to indicate hazards
- 2.5.1.3.2. Communications to cyclists alerting/informing/motivating thoughtful behaviour; perhaps explicit rule-setting (eg 'no riding on pavement').
- 2.5.1.3.3. Design of movement channels to separate different users; perhaps through incorporation of barriers. (Design conflict with preventing ambush for robbery.)

2.5.1.4. Design requirements to reduce **harm** If event happens

- 2.5.1.4.1. Design cluster configuration (and any enclosures/barriers) to allow one or other party to leave an escalating confrontation, or to escape if a fight starts. (Design conflict: but this may facilitate a robber's escape.)
- 2.5.1.4.2. If antagonist is pushed or falls, minimise protruding elements or sharp edges on which they could be injured.
- 2.5.1.4.3. *Risk factors for harm: elderly pedestrians/ cyclists; population carrying knives.*

2.6. Protecting cluster of stands or enclosure as environment of crime

2.6.1. Misbehaviour – conflicts between bike users – cross-locking

2.6.1.1. Details of criminal events

- 2.6.1.1.1. Cyclist 1 cross-locks cable etc through cyclist 2's bike, trapping second bike. Argument ensues, leading to verbal/physical aggression/ deliberate damage of bike.

2.6.1.2. General contextual risk factors increasing **probability** of undesired events

- 2.6.1.2.1. Insufficient parking spaces relative to demand, perhaps at peak times.
- 2.6.1.2.2. Young users?
- 2.6.1.2.3. Poor illumination – deep shadows?

2.6.1.3. Design requirements to reduce **probability** of undesired events

- 2.6.1.3.1. Consider designing single-user stands; moreover that are difficult to add a second bike to.
- 2.6.1.3.2. Alternatively, with two-user stands, make cross-locking pointless or difficult.
- 2.6.1.3.3. Consider increasing numbers of stands to meet demand (but tradeoff with crowding).
- 2.6.1.3.4. Communications to cyclists alerting/informing/motivating thoughtful behaviour; perhaps explicit rule-setting (eg 'no cross-locking').

2.6.1.4. Design requirements to reduce **harm** If event happens

- 2.6.1.4.1. As under 2.5.1.4.

2.7. Protecting user's ID as target of crime – Theft – ID theft from malfunctioning, insecure or tampered-with cash card machine. Not done

2.8. Protecting parking opportunity as target of crime – Fraud – Improperly obtained use of stand not done

3. Enclosure/ facility – outdoor/industrial – as object

Enclosures comprise several defining structural features: Periphery; Barrier; Entry point/s; Interior. (Note – here the ‘barrier’ aspect of entry points, such as a boom or gate, is considered as part of the main Barrier, albeit with specialised features/properties. Otherwise entry points are considered under the ‘in function’ section (4) that follows) Additional features may include common payment-handling fittings (eg a single one at or near the entry, for example, not one per stand) and common security fittings (eg one or two CCTV cameras).

3.1. Periphery

3.1.1. As environment of crime

3.1.1.1. Details of criminal events

- 3.1.1.1.1. Crimes in question are entire range (see below) against barrier, entry point, interior or contents of interior

3.1.1.2. Generic design requirements to reduce **probability** of undesired events

- 3.1.1.2.1. If possible (to the extent it is under the control of the designer and/or manager) the periphery should be kept clear of climbing aids and enjoy good sight lines and illumination on micro-meso scales.
- 3.1.1.2.2. The enclosure should not cast a deep shadow on the wider periphery, increasing crime risk there. This may involve attention to lighting in the meso environment in which enclosure is sited.
- 3.1.1.2.3. The enclosure should not, in conjunction with the configuration of the surrounding meso environment, create recesses or traps usable for lurking for robbery, hanging round for drug dealing, hanging round and creating noise and disorder.

3.1.1.3. Generic design requirements to reduce **harm** from undesired events

- 3.1.1.3.1. If possible (to the extent it is under the control of the designer and/or manager) the Periphery should be kept clear of climbing aids, points of leverage or bracing etc on micro scale, which could be used against Barrier; and enjoy good sight lines and illumination on micro-meso scales.
- 3.1.1.3.2. Consider possibility of bent/broken parts of barrier falling on people in periphery – where might they fall?

3.2. Barrier

Including barrier elements of entry point

3.2.1. As target of crime

3.2.1.1. *Deliberate damage - expressive mistreatment as end in itself*

3.2.1.1.1. Details of criminal events

- 3.2.1.1.2. **Wrecking** leading to deformation, fracture, uprooting; **defacement** by ink, spray paint, sticker; **cutting, abrasion** using range of brought and adventitious tools. Could also include **incidental** damage eg from bike users or pedestrians climbing over barrier as shortcut or to evade payment, or criminals escaping.

3.2.1.1.3. General contextual risk factors increasing **probability** of undesired events

- 3.2.1.1.3.1. See risk factors for bike stands [1.1.2.2.](#)

3.2.1.1.3.2. Climbing aids (fixed eg low walls, or mobile eg wheelie bins) in vicinity enabling offenders to climb onto or over barrier.

3.2.1.1.4. Design requirements to reduce **probability** of undesired events

3.2.1.1.4.1. See equivalents for bike stands [1.1.2.3.](#)

3.2.1.1.4.2. Construction and materials should be resistant (hardened or softened) to wrecking, defacement, cutting and abrasion.

3.2.1.1.4.3. In particular, to minimise graffiti and/or fly posting, large 'canvas'-type surfaces/ colours/ textures should be avoided

3.2.1.1.4.4. Operation (including forced movement) of moving parts eg boom/ gate should be particularly resistant to damage (hardening or softening) (may be conflicts with safe escape and security functionality – eg offender can escape or enter by forcing boom).

3.2.1.1.4.5. Barrier should not be sited/ constructed so as to cause a significant inconvenience to other users eg pedestrians, which could provoke damage.

3.2.1.1.4.6. It should not be easy to climb over barrier as a shortcut. If this is likely, consider making it robust (harder or softer); deterrent (increased risk to abuser, but within acceptable safety limits – no broken glass on top); or discouraging (requiring more effort/time).

3.2.1.1.5. Design requirements to reduce **harm** If event happens

3.2.1.1.5.1. See equivalent for bike stands [1.1.2.4.](#)

3.2.1.1.5.2. In particular, damaged elements should not cause a hazard if they lean, project or fall off into periphery and beyond; or interior; and as far as possible should not interfere with normal use of interior whilst awaiting repair.

3.2.1.1.5.3. To minimise reward to offenders and prompting of further attack, graffiti-covered surfaces should be easily/cheaply cleanable.

3.2.1.2. **Theft of barrier material**

3.2.1.2.1. As per theft of furniture [1.1.3.](#)

3.2.2. **As resource for crime**

3.2.2.1. **Misuse of barrier for concealment and entrapment**

3.2.2.2. Details of criminal events

3.2.2.2.1. Offender hides behind or within barrier in order to escape pursuit or avoid surveillance, perhaps to spring ambush on user of enclosure or passer by, perhaps to trap victim, or transact a drug deal; perhaps to commit various kinds of nuisance eg urination or damage eg graffiti to interior of barrier; perhaps as 'out of sight' gathering place for young people, interfering with designed function and/or causing more general nuisance eg through noise, litter.

3.2.2.3. Design requirements to reduce **probability** of undesired events

3.2.2.3.1. Barrier should be see through and perhaps low to aid visibility (though if too low could enable bypassing of entry point to gain entry).

3.2.2.3.2. Consider multiple exit points.

- 3.2.2.3.3. Barrier + interior layout should not create cul-de-sacs in which victims could be trapped.
- 3.2.2.4. **Misuse of barrier as climbing aid** – *whether as individual stand or a cluster*
 - 3.2.2.4.1. As per misuse of furniture for same [1.2.1.](#)
- 3.2.2.5. **Misuse of barrier for deceptive placing of bombs** – *whether as individual stand or a cluster*
... and **Mistake** – **false alarm if barrier used to place items resembling bomb**
 - 3.2.2.5.1. As per misuse of furniture for same, respectively [1.2.2.](#) and [1.2.3.](#)
- 3.2.2.6. **Misbehaviour** – **sitting/climbing on stands** – *individual or clusters...* and **bashing barrier to make noise**
 - 3.2.2.6.1. As per misuse of furniture for same, respectively [1.2.4.](#) and [1.2.5.](#)

3.3. Interior

Interior per se is distinct from what it contains – eg bike stands. Some aspects of interior layout already covered under configuration of bike stands under [1.](#) Interior surface of barrier can be treated same as exterior, under Barrier, [3.2.1.](#) above. Interior may be equipped with security fittings eg lights, CCTV cameras, which themselves may be targets of crime

3.3.1. As target of crime

- 3.3.1.1. **Deliberate damage as end in itself**
 - 3.3.1.1.1. Details of criminal events
 - 3.3.1.1.1.1. **Fittings, eg lights, cameras, payment machines wrecked.**
 - See Deliberate damage to furniture [1.1.2.](#)
- 3.3.1.2. **Theft of interior equipment**
 - 3.3.1.2.1. Details of criminal events
 - 3.3.1.2.1.1. **Fittings, eg lights, cameras, payment machines or their components are removed either by unscrewing as per design, or they or their anchorage are snapped or cut off.**
 - See Theft of furniture [1.1.3.](#)
- 3.3.1.3. Design requirements to reduce **probability** of undesired events
 - 3.3.1.3.1.1. Requirement for ease of replacement in servicing should not mean that equipment such as light bulbs etc can be casually removed without tools.
 - 3.3.1.3.1.2. If possible equipment should not be compatible with domestic use (eg different voltage light fittings); and discouraging communications to this effect should be visible on or near the equipment.

3.3.2. As environment of crime

Obviously, configuration of interior, barrier and contents eg bike stands should be considered as a whole.

3.3.2.1. **Theft/Robbery of users in interior**

- 3.3.2.1.1. Details of criminal events

3.3.2.1.1.1. Criminal uses interior, and perhaps items such as bike stands within it, to ambush and trap or to stealthily approach user in order to rob or steal money, bag etc.

3.3.2.1.2. Design requirements to reduce **probability** of undesired events

3.3.2.1.2.1. Internal configuration of interior of enclosure should not provide recesses for hiding/ambushing, or trapping user/victim.

3.3.2.1.2.2. Interior should be well-lit by natural and/or artificial light.

3.3.2.1.2.3. Interior configuration should be conducive to surveillance in terms of sightlines.

3.3.2.1.2.4. Interior configuration should not be modifiable by offender to neutralise the above properties.

3.3.2.1.2.5. Interior should offer no excuses/rationales for non-users to enter/loiter within.

3.3.2.1.2.6. Where robbery is a significant risk, on-site human guardianship should be considered; or at least via CCTV.

3.3.2.1.3. Design requirements to reduce **harm** from undesired events

3.3.2.1.3.1. Sharp edges or corners should be avoided in case victim is pushed/falls against them.

3.3.2.2. **Misbehaviour - Conflict between users in interior**

3.3.2.2.1. Details of criminal events

3.3.2.2.1.1. Collisions or jams lead to conflict and perhaps expressive violence and damage..

3.3.2.2.2. Design requirements to reduce **probability** of undesired events

3.3.2.2.2.1. Internal layout should minimise choke or collision points whether between cyclists wheeling bikes or cyclists purely on foot.

3.3.2.2.2.2. Conflicting parties should be able to leave scene of confrontation without difficulty, and not be trapped together.

3.3.2.2.3. Design requirements to reduce **harm** from undesired events

3.3.2.2.3.1. Sharp edges or corners should be avoided in case victim is pushed/falls against them.

3.3.3. **Misbehaviour – litter**

3.3.3.1. Details of criminal events

3.3.3.1.1. Users or other parties drop (or throw in) litter; litter is unsightly and could be fire risk... even deliberately lit.

3.3.3.2. General contextual risk factors increasing **probability** of undesired events

3.3.3.2.1. Proximity to fast food shops.

3.3.3.3. Design requirements to reduce **probability** of undesired events

3.3.3.3.1. Consider including litter bins or at least designing-in possibility for mounting them should this problem emerge; but depending on context may be design conflict with prevention of places to conceal bomb. Note that litter bins may themselves be arsonised.

3.3.3.4. Design requirements to reduce **harm** If event happens

3.3.3.4.1. Make for easy-sweeping of interior.

3.3.4. **Misbehaviour – urination**

3.3.4.1. Details of criminal events

3.3.4.1.1. Users or more usually other parties use interior of enclosure as toilet. Note – depending on configuration of enclosure in wider environment, risk could apply to periphery too.

3.3.4.2. General contextual risk factors increasing **probability** of undesired events

3.3.4.2.1. Proximity to pubs, entertainment district.

3.3.4.2.2. Absence of available WCs especially late at night.

3.3.4.2.3. Absence of wider CCTV monitoring of meso environment.

3.3.4.3. Design requirements to reduce **probability** of undesired events

3.3.4.3.1. See-through barriers and internal configuration.

3.3.4.4. Design requirements to reduce **harm** If event happens

3.3.4.4.1. Make for easy-washing of interior.

3.3.4.4.2. Ensure materials at waist height and below are resistant to corrosion from urine (design synergy – applies to dog wee too).

4. **Enclosure – outdoor/industrial – in function**

Intended security functions – reducing **probability** of criminal event/s; reducing and/or mitigating **harm** from immediate criminal event or wider consequences – **and how they work**

- a) Secures **bike and components** against **deliberate damage, theft**
- b) Secures **users and managers/guards** against **robbery** (users/cash collectors), and shelters them against **conflict**.
- c) Safeguards all **users, managers/guards, passers by, residents, businesses** etc against terrorist attack by deposition of bomb etc.
- d) Protects **stands** against **deliberate damage, theft, misuse and misbehaviour** (see **1** above).
- e) Secures any **payment-collecting system** against theft.
- f) **Self-protection** against attack, criminal countermoves aimed at disabling security function and misuse in furtherance of other crimes – all included under **3** above.

Note that the enclosure can be intended as a **security adaptation** which purposively shapes the 'risk environment' (Ekblom and Sidebottom 2007a) within which the stands are sited; which therefore deliberately controls the spatial and perhaps social context of the stands and hence manipulates many of the **risk factors** surrounding the stands, identified in **1 and 2** above. The design recommendations that apply to the environment created by clusters of stands, or individual stands plus any incidental walls or barriers that happen to be nearby, equally apply to facilities with deliberately designed enclosures. In a fully-developed guidance document, these recommendations would be repeated, with different emphasis, under both furniture and facility to cater for the different kinds of designer who maybe referring to them.

All the above functions are achieved through acting as a designed, enclosed micro-environment for bike stands and users approaching/employing them. They work in more detail by enabling/ facilitating some or all of the following **preventive mechanisms**. Some of these mechanisms tip the **instrumental** balance in favour of preventers over offenders in the exercise of their scripts (eg surveillance v stealth), or by **motivating** or otherwise causally influencing one or other party: [should these be converted into safeguarding etc, where possible? But enclosed environment is too generic to cast into similar statement to furniture-in-function]

- **Controlling access** by offenders to interior space – technologically or by human staff
- **Mobilising (Alerting, Informing, Motivating, Empowering)** guards/managers/users/others to **control behaviour/ check people** entering or leaving interior
- **Limiting escape of criminal** on completion of crime, or of attempt
- Limiting **space and barriers for hiding**
- Limiting **space for undertaking criminal actions** (leverage etc).
- Defining limited interior space requiring **surveillance**
- Defining **expected actions/users** at access point and within interior, hence **clarifying suspicious behaviour and people** to improve **detection and challenge** performance for surveillers
- Defining interior space setting subject to **rules** for good behaviour
- Providing well-defined **sightlines for surveillance** (natural or technological) within **interior and at entry point/s**
- Providing location/mounting for **security communications** to users, offenders; for **technological surveillance** aids eg CCTV

- **Channelling different street users** along different paths/into different spaces to avoid **conflict**
- Avoiding **provocation or prompting of attack on enclosure itself**

Notes

- The enclosure may have many variants, including those where bike is mechanically taken from user at entry point and stored in compartment to which users have no access at all.
- Enclosure may or may not have a gate/boom; may or may not have a common payment-gathering point. Payment function can be treated as per guidance on stand-based payment – see [2.2](#) [2.3](#).
- Enclosure may or may not be guarded.
- Enclosure may or may not be in public, semi-public or private space; and its interior may be similarly defined by one of these alternatives.

4.1. **Enclosure protecting contents of interior by enabling/delivering access control**

4.1.1. **Mishandling – entry (and exit) without justification or permission**

4.1.1.1. Details of criminal events

- 4.1.1.1.1. People with no right to enter enclosure, climb over barrier or slip through entry point, perhaps defeating any ticket/payment mechanisms by fraudulent means. Escaping offenders climb or slip through in reverse.

4.1.1.2. General contextual risk factors increasing **probability** of undesired events

- 4.1.1.2.1. High-value bikes frequently parked here.

4.1.1.3. Design requirements to reduce **probability** of undesired events

- 4.1.1.3.1. Ensure barrier (including any gate) is difficult to climb over in either direction. If this is likely, consider making it robust (harder or softer); deterrent (increased risk to abuser, but within acceptable safety limits – no broken glass on top); or discouraging (requiring more effort/time).
- 4.1.1.3.2. Ensure passing into enclosure does not offer concealment hence attract offenders.
- 4.1.1.3.3. If improper entry is a frequent/significant problem, consider additional surveillance/guarding.
- 4.1.1.3.4. If enclosure is guarded, ensure climbing over barrier is visible.
- 4.1.1.3.5. Ensure any technological entry control is reliably discriminating; minimally provocative (eg unreliable or difficult to operate) and robust against attack (see [2.1.4](#) on breaking/picking/ electronically defeating lock)
- 4.1.1.3.6. If entry control is remotely monitored by guards, ensure sightlines, illumination and if necessary CCTV cameras are adequate for surveillance; and that some response capabilities exist.
- 4.1.1.3.7. If (although unlikely) there is a guard in place at the entry point, ensure they can see people approaching intent on entry; there is space and illumination for them to check permission; the entrance is blockable either by a gate/boom or the person of the guard (but beware risk of confrontation); and in high-risk environments with frequent aggressive or drunken behaviour that the guard has means of protection eg a booth and of summoning help.

- 4.1.1.3.8. Ensure entry line to the enclosure is clearly marked, which may deter improper entry and empower guard.
- 4.1.1.4. Design requirements to reduce **harm** from preventive measures themselves
 - 4.1.1.4.1. Minimise chances of collision (and also perhaps consequent conflict) between users at entry/exit, perhaps by channelling flow using interior layout, markings etc.
- 4.1.1.5. Design requirements to reduce **harm** If event happens
 - 4.1.1.5.1. Ensure second line of defence – that interior environment, bike stands themselves and other contents of enclosure are crime resistant should improper entry be gained. Decide on balance between entry-point and interior security.
 - 4.1.1.5.2. Ensure passing into enclosure does not offer concealment allowing offenders to perform further misdeeds.
- 4.1.2. **Mistreatment – entry to enclosure gained by damaging barrier/entry control equipment**
 - 4.1.2.1. Details of criminal events
 - 4.1.2.1.1. Offenders damage gate mechanism or main part of barrier in order to get in/out – with bodily force eg, kicking/barging, twisting or with brought/adventitious hand tools for levering, cutting, drilling etc (depending on context).
 - 4.1.2.2. General contextual risk factors increasing **probability** of undesired events
 - 4.1.2.2.1. Few people present/ in position to see actions/ motivated to respond.
 - 4.1.2.3. Design requirements to reduce **probability** of undesired events
 - 4.1.2.3.1. Gate mechanism should be robust against force and/or tools as described.
 - 4.1.2.4. Design requirements to reduce **harm** If event happens
 - 4.1.2.4.1. See reducing harm from damage to furniture [1.1.2.4.](#)
 - 4.1.2.4.2. Gate mechanism should fail safe – people should not be trapped within enclosure (especially if barrier is difficult to climb).
 - 4.1.2.4.3. Depending on the level of risk to the now-less-protected contents of the interior, and issues of revenue collection, interior should either remain fully usable if gate damaged, or sealable-off.

4.2. Enclosure mobilising people to protect itself and its contents

- 4.2.1. **Supports crime preventer role**
 - 4.2.1.1. Details of criminal events
 - 4.2.1.1.1. All kinds of criminal events covered, especially those that bike users, pedestrians and other users/occupants of space in the vicinity can influence when acting as informal crime preventers.
 - 4.2.1.2. Design requirements to reduce **probability** of undesired events
 - 4.2.1.2.1. Alert preventers by communications describing crime risks.
 - 4.2.1.2.2. Inform preventers of what constitutes inappropriate presence and criminal/suspicious actions (eg by communications)

- 4.2.1.2.3. Motivate preventers by including them in design process and/or paying heed to their preferences/requirements, especially where enclosure might interfere with their interests eg as pedestrian passers-by, shopkeepers. Ensure décor fits well with environment or (in their eyes) improves it.
 - 4.2.1.2.4. Empower preventers a) by aiding informal surveillance – clear sightlines, illumination etc; making inappropriate presence and/or actions within enclosure appear obvious and unambiguous; b) by telling preventers what to do if this happens; if appropriate supplying alarm function etc.
 - 4.2.1.2.5. Ensure **offenders** get the same message as preventers – which should deter and discourage them; but avoid giving away too much detail about how preventive measures work, which could help offenders circumvent them and would remove the deterrent ‘uncertainty factor’.
- 4.2.1.3. Design requirements to reduce **harm** If event happens
- 4.2.1.3.1. Given that many of the probability-reducing interventions act when offender is on point of committing the crime, or actually undertaking it, harm reduction comes from cutting the event short and/or immediate reporting of any damage.

7. Conclusions

The entire Work Package (WPA2) has been an evolutionary, iterative exercise extended over some two years, so it is appropriate to make some reflections.

The main aim of the work package was to see whether a theory-based framework could produce usable guidance for Design Against Crime, and in particular for secure bike parking, which could then be compared with guidance based on distillation from experience. Ultimately (beyond the current work package) this would lead to an improved, combined set of guidance and/or standards, and further possible applications discussed below.

Delivering the work package involved action at a number of levels: collaboration, and evolution of mutual understanding, among a small cross-disciplinary group of crime scientists and designers; development, through that collaboration, of a framework for undertaking crime risk analysis and for generating design guidance based on the outcome of that analysis; and using the developed framework to populate the risk analysis and then convert it into design guidance. In practice these activities were not distinct and did not follow a linear sequence: as might be expected there was much iteration, during the early stages of which the use of conceptual sketches and diagrams (involving a graphic designer) was important. Even quite fundamental changes were occasionally being made relatively late on in the work package.

Collaboration

The evolutionary process in its widest form showed that it was not only possible, but stimulating and challenging, for designers and crime scientists to collaborate on an extended project that has both practical and theoretical dimensions within both disciplines. But this did require goodwill, effort and persistence, and a willingness both take constructive and critical steps into the others' domains and just as important, to allow the others into their own.

In the end, the collaboration helped to create concepts and language that verged on being entirely new interdisciplinary territory. It also turned a critical searchlight onto existing domains. The development of the CCO Dynamic framework in particular, not only represented a substantial development and extension of the original CCO Classic framework (the starting point), but also raised some challenging questions for crime science (for example about the nature of risk) and the tenets and practice of Situational Crime Prevention more generally.

Creating the framework

The creation of the new framework was perhaps yet another recursive layer of the capacity-evolving process described in the Introduction. It developed our *own* capacity to develop both innovative capacity for designers, and operational capacity for crime prevention practitioners when using the fruits of that design.

The detailed activity of creating the framework and procedure for undertaking full risk analysis and producing corresponding design guidance proved to be rather demanding. This was because (between team discussions) the author was simultaneously *developing the framework categories and headings*, and *populating the entries* under the headings by undertaking the pilot analysis process with those categories. This involved much iteration as new exemplars often required backtracking to update the categories for previous entries, and occasionally to reconfigure the framework and the process more widely.

Getting the categories right, and handling the entry information in an efficient way, was a matter of balancing detailed distinction against generality. This not only applied to the analysis of possibility, probability and harm, but also to the characterisation of each design focus to be considered. For example, there are many variations on bike stands, some with captive locks, some with inbuilt individual payment systems and others part of a complete facility with common payment equipment at the entrance. Bike stands could be considered as individual instances or as clusters (where each formed part of the micro-environment of its neighbours and perhaps affected risk of crime by blocking the view or supplying points of leverage). Guidance that was too generalised would constitute a sort of ‘average’ across designs that would merely be trite and unstimulating. Guidance that was too detailed would be massively repetitive and could overload the designer with material to wade through (or more likely, to avoid). In the end, enough design variants were pursued to cover the most common range and supply a comprehensive-enough coverage for the immediate purpose of this work package (comparison with, and extension of, the experience-based guidance material). These also served to give sufficient numbers of detailed exemplars to illustrate the framework and how it could be used.

Applying the framework to generate risk analysis and design recommendations

Applying the framework and procedure in practice involved a substantial sequence of ‘thinking by numbers’ – of deliberate switches of attention and perspective, and focused visualisation of combinations of circumstances whilst thinking thief, and imagining the perspectives of other agents too – crime preventers and promoters. When the procedure evolved from that of separate risk analysis followed by design guidance to doing the two tasks simultaneously, even more had to be held in the head at once. However, paradoxically the channelling of thinking from design complicity in causing crime to design responses, was not in fact such a great mental leap.

Nonetheless, any practical system for generating design-against-crime risk analyses and guidance would have to provide considerable support for the user undertaking the procedures and drawing on the frameworks. This support would best be provided through IT. Interactive forms could prompt and focus the user's attention, topic by topic, and context-sensitive drop-down menus could show only those choices of category the user needed to think about there and then. The system could also *learn* by including the scope for adding on or revising categories and content. It could manage the production of a final standard-format report, with a background audit trail of the logic from risk analysis to design recommendation. It could perhaps be linked to a knowledge pool which stored and retrieved guidance and risk analyses selectively.

Presenting and disseminating the framework and its results

The final design guidance presented the results in a way which understated the framework rather than signalling its presence and terminology in every heading. To the extent that underlying theories and principles are hidden, designers are confined to the specifics of the guidance given. To the extent that the theories, principles and language are explicit, designers are empowered to generate their *own* guidance for contingencies and contexts not covered – true innovative capacity. (They also acquire the ability to apply the framework in other commissions.) Such capacity is vital given the many contextual factors, the delicacy of some preventive mechanisms, the need to innovate and out-anticipate adaptive criminals and wider, *non*-crime design requirements which shape the designer's task. In many cases, cookbook copying of ready-made solutions doesn't work (Eckblom 2002; Tilley 1993).

But the start-up cost of having to become familiar with a new framework with its own language and concepts could be burdensome and discouraging. And in any case, designers may have been given only limited scope from their clients to attend to the crime side of their brief. There is obviously no single correct solution to this dilemma. Rather, it implies the need to develop of a range of alternative formats of the guidance suited at one end of the scale to crime prevention practitioners and bike facility commissioners and builders (who might work off a checklist), to designers with limited scope and skill, to those who have the capacity and the opportunity to 'go in deep'. This of course resembles the situation in medicine, where a single, highly-sophisticated framework of medical science underlies everything from elementary family first-aid and health books and websites to general practitioner education and reference materials to leading-edge guidance for advanced brain surgery.

Who would undertake risk analysis and preparation of design guidance of this kind?

The current exercise was led, and mainly conducted, by a crime scientist reasonably familiar with design, aided by a mixed group of designers and other crime scientists. It is likely that this mix would have to be replicated in developing similar analyses and guidance for other areas of Design Against Crime. Now the framework and procedure have been developed (at least to Version 1.0), future applications should be rather less demanding. However, the judgement, interpretation and intelligent compromise of complexity and detail that would irreducibly remain means that this can never be a mechanical procedure.

Taking the design guidance further

The sequence for design guidance set out in this report so far has been to proceed from specifying the design focus, to analysis of the risks attending that product or place, to functional design specifications of the kind attempted here. Where might it go next? The ‘intervention’ side of CCO can give a very broad steer (eg if the target is vulnerable, increase its resistance to crime by hardening or softening it; if valuable, reduce that value; if provocative, make it less so). But as currently developed these do not go much further than restating risks in an alternative discourse. However, experimental attempts to develop progressively branching typologies of the criminogenic and criminocclusive (crime-reducing) properties of the designed entities (eg space: visibility: sightlines and illumination etc)²⁵ could constitute a further step and an accumulation of knowledge which would also help frame the risk analysis in greater depth.

An alternative source of generic crime prevention interventions is of course the 25 techniques of SCP.²⁶ While CCO considers causes and interventions in terms of analytic principles, amounting to abstractions of mechanisms, the 25 techniques are a ‘natural history’ of practical intervention methods organised around the world as the offender sees and experiences it – in terms of perceived risk, effort, reward, provocation and guilt. The resulting list has immediate face-validity, and design-related interventions can be readily identified to populate each cell. But depending on how individual designers think and are inspired to innovate (and on the time and scope they have for the task), tangible exemplars may not be not so ‘generative’ as principles. The view from the offender is only one of several perspectives that could be taken – with design, of course, we are already interested in the view from the legitimate user or manager who could act as preventers or promoters. CCO Dynamic itself envisages adaptive offenders, scripts and script clashes which make statements such as ‘this intervention increases the effort of offending’ rather too clumsy to use.

²⁵ As illustrated in the CCO Dynamic slide presentation
www.designagainstcrime.com/files/CCO_Dynamic_Design_framework.ppt.

²⁶ See www.popcenter.org/25techniques/

Perhaps the best approach would be a combined one, with a widened range of exemplars like the 25 techniques but not necessarily organised exclusively around the view from the offender, complementing generic intervention principles worked up into greater detail. Designers could then follow the approach that best suited their capacities and circumstances.

The evidentiary basis of the guidance

It is worth commenting on the evidentiary status of the guidance and any subsequent standards produced by CCO.

The current exercise has shown that CCO, even as modified, could not produce useful output unaided – it had to be supplemented by some very generic knowledge of bike theft perpetrator techniques, bike stand designs etc. This is to be expected – tools, even ‘tools for thought’, have to work on some substrate: they cannot deliver if merely waved around in the air, however energetically.

Knowledge – in the form of research evidence – is therefore also needed of crime risk in its three aspects of possibility, probability and harm. Bare statistics of bike theft are fairly readily available in the UK at least, though these are far from perfect and insufficiently rich in detail for guiding crime prevention. Information such as place/type of place of theft, perpetrator technique, make and model of bike, locking arrangements that failed, etc, are rarely available in quantifiable form, or even in detailed qualitative form, save from special research exercises. Such information would not only be useful as an input to design, but could also support commercial and governmental decisionmaking and action against cycle crime, for example by prioritising ‘hot’ targets for action, and by naming and shaming companies which acted as crime promoters through inadequate attention to the security of the products they manufactured. This happened with the security of cars, although unique circumstances enabled the collection and integration of such information into a UK Car Theft Index.²⁷

It has also been argued that CCO, informed by knowledge of risks, can only lead as far as *guidance*. Standards require further information based on more formal testing and comparative evaluation of alternatives, to be able to state which are best; and even which are best for which context. The formal evidence base for Design Against Crime is so far relatively limited (Ekblom 2005a) but that for the wider field of Situational Crime Prevention has a fairly long history (Clarke 1997; Ekblom 1998; Welsh and Farrington 1999). The Center for Problem-Oriented Policing is now compiling an evidence base of evaluations of Situational Crime Prevention²⁸.

²⁷ www.homeoffice.gov.uk/documents/car-theft-index/

²⁸ www.popcenter.org/library/scp

CCO (and its predecessor, Proximal Circumstances (Eckblom 1994)) was originally created as a means of integrating principles of prevention of crime, based on theories of causation; it was deliberately agnostic about the validity of the principles, merely claiming to map 'intervention space' as a set of preventive possibilities which it was the task of subsequent evaluations to confirm or refute. But given that CCO is essentially regurgitating highly generic principles distilled from a great deal of past research and evaluations, mostly assembled through individual theories such as Routine Activity Theory, it is fair to claim that those principles are in one sense already evidence-based. As Eck puts it,

"the answer to the question, "what works?" to prevent crime at places is "routine activity theory and situational crime prevention." The answer is not, CCTV, lighting, locks, management screening of prospective tenants, nuisance abatement, street redesign or any other particular measure. These are tools that might work in some circumstances but probably do not work in every circumstance (Clarke, 1997)." (2004:105)

The implication is that the strong evidence is generic, but that individual preventive methods, and more particularly specific methods realised in specific detail in specific contexts, can only ever be labelled more or less 'plausible'. However, the evidentiary basis of the experience-derived guidelines and standards against which CCO is to be compared in the current project, is even less robust. In most cases the claims of experience are confined to explicit or implicit assertions of effectiveness against crime without benefit of even the support of functional testing, let alone impact evaluation.

Wider applications of the procedure and framework

The procedure and framework developed here can be used to develop risk analysis and guidance for design against *other* crime problems – it was intentionally designed to be generic and versatile. There is also scope for linking the risk analysis to the approach known as **crime proofing** (Armitage and Pease 2007; Eckblom and Sidebottom 2007a)²⁹, in which products at the design stage are reviewed for the risks of crime to which they might be exposed in their working life, and then assessed for whether they have commensurate levels of security.

In outcome terms, and referring back to the terminology introduced on p5 of the Introduction, this report has described the initial version of a conceptual tool to increase the **innovative capacity** of designers and developers of design guidance, in the form of a prototype framework for undertaking systematic and rigorous crime risk analysis and generating corresponding design considerations; and an initial version of the means of

²⁹ See also www.designagainstcrime.com/index.php?q=node/82 and www.designagainstcrime.com/index.php?q=node/87 for material on risk and security, and crime proofing.

communicating the framework to both professional end users and students. The tool, and the documentation, are applicable to most Design Against Crime initiatives. If the tool becomes widely used, the benefit will be a step increase in the ability of developers of design against crime guides to undertake their work (innovative capacity building of developers of design guides); this will in turn increase the ability of designers using those guides to quickly and effectively tackle crime problems (innovative capacity building of designers); this should ultimately build **operational capacity** for crime prevention interventions on the ground (ie new secure, securing and security products to deploy); ultimately this should reduce crime and associated problems, as well as creating wealth by making marketable capabilities and marketable products. The risk analysis/design guidance tool will be tested against output of Best of Breed (WPA 1) contributing to further output WPA 4. The utility of the tool, and the effectiveness of the materials to communicate it, will ultimately be tested in the field – not part of this portfolio. But it has been used within the DAC Research Centre in support of other recent projects.

It is also possible that the CCO-Dynamic framework could be used to organise the knowledge, from whatever source, about bike crime, its causes, consequences and preventive interventions. Only by arranging knowledge in this way can gaps be discerned - and hopefully then closed by research, practice and evaluation.

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Appendix 1 Full CCO-M&S crime risk analysis for bike parking furniture

Colour code
Design focus – product/place that’s designed
Causal roles it plays in crime – CCO entities
<u>Generic kinds of crime risk involved</u> – M&S
Specific crime and perpetrator technique [‘crime mode’?] – the <i>possibilities</i> of criminal events
For each possibility of crime, how its risk – probability and harm – are influenced by design of product and/or the physical/social context in which the product or place is located, using the agents and other entities within CCO and if necessary higher, emergent levels such as markets and networks

Notes

1. Some rows have been left unfilled – this is a consequence of the repeated insertion of the generic risk analysis template. But when reading off the risk considerations into design implications even the bare headings proved a useful reminder (for example, of the different roles that could act as crime preventers).
2. The risk analysis as a separate exercise was only completed for the bike parking Furniture as object and in-function. For the bike parking Facility, the risk analysis was done using the same headings, but the results were written directly into the design guidance template.

Crime Risk analysis: Criminal events,
their probability and harm,
and the design and contextual factors influencing these
for a given designed object or place

2. Furniture – *individual stand or cluster – as object*

2.1. Target of crime

2.1.1. Damaged (Mistreated) by

2.1.1.1. Wrecking

2.1.1.1.1. **Probability** of crime

2.1.1.1.1.1. Overall *magnitude of probability*

2.1.1.1.1.2. *Magnitude depends on*

2.1.1.1.1.2.1. **Design** of product's influences on probability of crime

2.1.1.1.1.2.1.1. Inherent visibility of product prompts attack

2.1.1.1.1.2.1.1.1. *Cluster* may be a more obvious target set to offender

2.1.1.1.1.2.1.2. Value of product to offender – rewarding to damage product – eg makes satisfying noise/shape

2.1.1.1.1.2.1.3. Prompting and provocation by distinctive shape; by being an authority symbol (signs, notices, gates, barriers)

2.1.1.1.1.2.1.4. Susceptibility to deformation, fracture, uprooting, jamming – see 1.1.1.1.4.3.1.1. below
2.1.1.1.1.2.2. Contextual influences on probability of crime
2.1.1.1.1.2.2.1. Target
2.1.1.1.1.2.2.1.1. In a cluster, one stand may act as a point of leverage or brace in attacking another – strictly part of instrumental environment
2.1.1.1.1.2.2.2. Environment – instrumental
2.1.1.1.1.2.2.2.1. Accessibility – inc space for leverage surrounding <i>individual</i> stand or <i>cluster</i>
2.1.1.1.1.2.2.2.2. Poor surveillability in immediate environment from sightlines/ lighting
....1.2.1. <i>Cluster</i> may affect sightlines eg if offender may be hidden if crouched down between stands
2.1.1.1.1.2.2.2.3. Defensibility – see also separate handling of enclosure below
2.1.1.1.1.2.2.3. Environment – motivating
2.1.1.1.1.2.2.3.1. Lack of legitimate entertainment supplies time and causes readiness to offend
2.1.1.1.1.2.2.3.2. Territory of preventer
2.1.1.1.1.2.2.4. Offender presence
2.1.1.1.1.2.2.4.1. Dislike of cyclists
2.1.1.1.1.2.2.4.2. Drunk/rowdy state
2.1.1.1.1.2.2.5. Offender perception
2.1.1.1.1.2.2.6. Offender resources – brought tools
2.1.1.1.1.2.2.6.1. Cutters, levers, spanners
2.1.1.1.1.2.2.7. Offender resources – locally found
2.1.1.1.1.2.2.7.1. Stones, levers eg scaffold poles
2.1.1.1.1.2.2.8. Promoter presence/action or inaction
2.1.1.1.1.2.2.8.1. Friends urging/supporting misbehaviour – pressure
2.1.1.1.1.2.2.8.2. Slow repair prompts fresh attack by sight of existing damage

2.1.1.1.1.2.2.8.3.	Poor installation facilitates damage
2.1.1.1.1.2.2.9.	Preventer presence/action – user
2.1.1.1.1.2.2.9.1.	Affected by short/med/long stay
2.1.1.1.1.2.2.10.	Preventer presence/perception/action – passer-by
2.1.1.1.1.2.2.11.	Preventer resources – passer-by
2.1.1.1.1.2.2.12.	Preventer presence/perception/action – guard/manager
2.1.1.1.1.2.2.13.	Preventer resources – guard/manager
2.1.1.1.1.2.2.13.1.	Visual/audio surveillance aids
2.1.1.1.2. Harm from crime	
2.1.1.1.2.1. Immediate harms <i>mediated by</i>	
2.1.1.1.2.1.1.	<i>Design</i>
2.1.1.1.2.1.2.	Harm to product itself during criminal event – susceptibility to:
2.1.1.1.2.1.2.1.	Deformation of body or anchorage
2.1.1.1.2.1.2.2.	Fracture of body or anchorage
2.1.1.1.2.1.2.3.	Uprooting of anchorage
2.1.1.1.2.1.3. Post-event: harm from <i>design</i> of product	
2.1.1.1.2.1.3.1.	Sharp points or edges left
2.1.1.1.2.1.3.2.	Trip hazard left
2.1.1.1.2.1.3.3.	Uplifted/broken paving
2.1.1.1.2.2. Wider harms	
2.1.1.1.2.2.1.	Denial of use (impact on convenience, habitual decision to cycle...)
2.1.1.1.2.2.2. Cost and effort of repair/replacement	
2.1.1.1.2.2.3. Injury from cutting or tripping	
2.1.1.1.2.2.4. Incivility – generates general fear of crime	

2.1.1.1.2.2.5.	Incivility – generates specific perceived risk of damage/loss of bike, hence deters parking and use
2.1.1.1.2.2.6.	Aesthetic degradation of site – environmental quality of life
2.1.1.1.2.2.7.	<i>Contextual influences on wider harm</i>
2.1.1.1.2.2.7.1.	Delay/difficulty in repair/replacement
2.1.1.1.2.2.7.2.	Susceptible users of site (eg blind, elderly)
2.1.1.1.2.3.	Overall <i>severity</i> of harms [M]
2.1.1.2. Defacement by ink, paint or sticker	
2.1.1.2.1.	Probability of crime
2.1.1.2.2.	Overall <i>magnitude of probability</i> [M]
2.1.1.2.3.	<i>Magnitude depends on</i>
2.1.1.2.3.1.	Design of product's influences on probability of crime
2.1.1.2.3.1.1.	Inherent visibility of product
2.1.1.2.3.1.2.	Value (rewarding to offender to damage – eg tag is well visible and potentially durable/hard to remove)
2.1.1.2.3.1.3.	Provocation by distinctive shape
2.1.1.2.3.1.4.	Susceptibility to adhesion by paint/ink
2.1.1.2.3.2.	Contextual influences on probability of crime
2.1.1.2.3.2.1.	Environment – instrumental
2.1.1.2.3.2.1.1.	Accessibility
2.1.1.2.3.2.1.2.	Poor surveillability in immediate environment from sightlines/ lighting
2.1.1.2.3.2.2.	Environment – motivating
2.1.1.2.3.2.2.1.	Lack of legitimate entertainment supplies time and causes readiness to offend
2.1.1.2.3.2.2.2.	Territory of preventer
2.1.1.2.3.2.3.	Offender presence
2.1.1.2.3.2.4.	Offender perception

2.1.1.2.3.2.5.	Offender resources – brought tools
2.1.1.2.3.2.5.1.	spraycans, marker pens, sticky labels
2.1.1.2.3.2.6.	Offender resources – locally found tools
2.1.1.2.3.2.7.	Promoter presence/action or inaction
2.1.1.2.3.2.7.1.	eg friends urging/supporting misbehaviour – pressure
2.1.1.2.3.2.8.	Presence of preventers – users
2.1.1.2.3.2.8.1.	Affected by short/med/long stay
2.1.1.2.3.2.9.	Preventer presence/perception/action – passer-by
2.1.1.2.3.2.10.	Preventer resources – passer-by
2.1.1.2.3.2.11.	Preventer presence/perception/action – guard/manager
2.1.1.2.3.2.12.	Preventer resources – guard/manager
2.1.1.2.3.2.12.1.	Mitigation/further prevention – eg rapid application of cleaning materials; calling in cleaning team
2.1.1.2.3.2.13.	Provocation of offenders by officious notices, over-zealous guards
2.1.1.2.3.2.14.	Prompting fresh attack by sight of existing marks – depends on speed of cleaning
2.1.1.2.4. Harm from crime	
2.1.1.2.4.1. Immediate harms <i>mediated by Design</i>	
2.1.1.2.4.1.1.	Harm to product itself during criminal event – susceptibility to:
2.1.1.2.4.1.1.1.	Temporary spoiling of appearance
2.1.1.2.4.1.1.2.	Permanent wearing or destruction of surface
2.1.1.2.4.1.2. Post-event: harm from paint/ink/stickers	
2.1.1.2.4.1.2.1.	Degradation of product surface due to reaction with paint etc
2.1.1.2.4.1.2.2.	Removal of paint etc in cleanup causes degradation of surface
2.1.1.2.4.2. Wider harms	
2.1.1.2.4.2.1.	Denial of use during repair (impact on convenience, habitual decision to cycle...)

2.1.1.2.4.2.2. Cost of repair/replacement
2.1.1.2.4.2.3. Incivility – generates general fear of crime
2.1.1.2.4.2.4. Incivility – generates specific perceived risk of damage/loss of bike, hence deters parking and use
2.1.1.2.4.2.5. Aesthetic degradation of site – environmental quality of life
2.1.1.2.4.2.6. <i>Contextual influences on wider harm</i>
2.1.1.2.4.2.6.1. Delay/difficulty in cleaning/ repair/ replacement
2.1.1.2.4.2.6.2. Especially fearful users of site (eg elderly)
2.1.1.2.4.3. Overall severity of harms [0/L/M/H]
2.1.1.3. Defacement by scratching/abrasion
2.1.1.3.1. Probability of crime
2.1.1.3.2. Overall <i>magnitude of probability</i> [H]
2.1.1.3.3. <i>Probability depends on</i>
2.1.1.3.3.1. Design of product's influences on probability of crime
2.1.1.3.3.1.1. Inherent visibility of product
2.1.1.3.3.1.2. Value (rewarding to offender to damage – eg scratched tag is well visible and potentially durable/hard to remove; scratching action reveals bright surface)
2.1.1.3.3.1.3. Provocation by distinctive shape
2.1.1.3.3.1.4. Susceptibility to scratching
2.1.1.3.3.2. Contextual influences on probability of crime
2.1.1.3.3.2.1. Environment – instrumental
2.1.1.3.3.2.1.1. Accessibility
2.1.1.3.3.2.1.2. Poor surveillability in immediate environment from sightlines/ lighting
2.1.1.3.3.2.2. Environment – motivating
2.1.1.3.3.2.2.1. Lack of legitimate entertainment supplies time and causes readiness to offend

2.1.1.3.3.2.2.2. Territory of preventer
2.1.1.3.3.2.3. Offender presence
2.1.1.3.3.2.4. Offender perception
2.1.1.3.3.2.5. Offender resources – brought tools
2.1.1.3.3.2.5.1. Diamond rings, engraving tools?
2.1.1.3.3.2.6. Offender resources – locally found tools
2.1.1.3.3.2.6.1. Sharp stones etc in vicinity
2.1.1.3.3.2.7. Promoter presence/action or inaction
2.1.1.3.3.2.7.1. Friends urging/supporting misbehaviour – pressure
2.1.1.3.3.2.7.2. Slow repair prompts fresh attack by sight of existing damage
2.1.1.3.3.2.8. Preventer presence/action
2.1.1.3.3.2.8.1. eg friends urging misbehaviour
2.1.1.3.3.2.9. Presence of preventers – users
2.1.1.3.3.2.9.1. Affected by short/med/long stay
2.1.1.3.3.2.10. Preventer presence/perception/action – passer-by
2.1.1.3.3.2.11. Preventer resources – passer-by
2.1.1.3.3.2.12. Preventer presence/perception/action – guard/manager
2.1.1.3.3.2.13. Preventer resources – guard/manager
2.1.1.3.3.2.13.1.
2.1.1.3.4. Harm from crime
2.1.1.3.4.1. Immediate harms <i>mediated by Design</i>
2.1.1.3.4.1.1. Criminal event: harm to product itself – susceptibility to:
2.1.1.3.4.1.1.1. Temporary spoiling of appearance
2.1.1.3.4.1.1.2. Permanent wearing or destruction of surface

2.1.1.3.4.1.2. Post-event: harm from scratches
2.1.1.3.4.1.2.1. Degradation of surface due to rust, flaking etc (outdoor issue)
2.1.1.3.4.2. Wider harms
2.1.1.3.4.2.1. Denial of use during repair (impact on convenience, habitual decision to cycle...)
2.1.1.3.4.2.2. Cost of repair/replacement
2.1.1.3.4.2.3. Incivility – generates general fear of crime
2.1.1.3.4.2.4. Incivility - generates specific perceived risk of damage/loss of bike, hence deters parking and use
2.1.1.3.4.2.5. Aesthetic degradation of site – environmental quality of life
2.1.1.3.4.2.6. Contextual influences on wider harm
2.1.1.3.4.2.6.1. Delay/difficulty in cleaning/ repair/ replacement
2.1.1.3.4.2.6.2. Especially fearful users of site (eg elderly)
2.1.1.3.4.3. Overall severity of harms [L]
2.1.2. Misappropriated (Stolen) (note – consider damage from failed theft attempt as harms from wrecking 1.1.1.1.4. and/or scratching/abrasion 1.1.1.3.4 as appropriate)
2.1.2.1. Stolen for resale or scrap combined
2.1.2.1.1. Probability of crime
2.1.2.1.2. Overall magnitude of probability [L]
2.1.2.1.3. Magnitude depends on
2.1.2.1.3.1. Design of product – influences on probability of crime
2.1.2.1.3.1.1. Inherent visibility of product
2.1.2.1.3.1.2. Value (rewarding to offender to sell as scrap, or for resale)
2.1.2.1.3.1.3. Susceptibility to removal – in pieces or as undamaged whole
2.1.2.1.3.1.3.1. Ease of cutting stand – shape, thickness, material (time offender exposed to risk of detection, effort, tool requirement)

2.1.2.1.3.1.3.2.	Visibility, audibility and obviousness of criminal intent of offender actions in removing stand (risk of detection, effort of any countermoves eg deadening cloth)
2.1.2.1.3.1.3.3.	Ease/difficulty with which the stand can be properly anchored to ground in installation
2.1.2.1.3.1.3.4.	Requirement for maintenance of anchoring mechanism eg tightening of bolts
2.1.2.1.3.1.3.5.	Ease of dismounting from anchorage eg requiring specialist tools
2.1.2.1.3.2. Contextual influences on probability of crime	
2.1.2.1.3.2.1. Environment – instrumental	
2.1.2.1.3.2.1.1.	Accessibility – vehicular access needed close by
2.1.2.1.3.2.1.2.	Space – for cutting, levering, striking
2.1.2.1.3.2.1.3.	Poor surveillability in immediate environment from sightlines/ lighting
2.1.2.1.3.2.2. Environment – motivating	
2.1.2.1.3.2.2.1. Territory of preventer	
2.1.2.1.3.2.3. Offender presence	
2.1.2.1.3.2.3.1.1. More likely planned than opportunist	
2.1.2.1.3.2.3.1.2. Possible co-offenders required – leverage, carrying, lookout etc	
2.1.2.1.3.2.4. Offender perception	
2.1.2.1.3.2.5. Offender resources – brought	
2.1.2.1.3.2.5.1.	Cutters, spanners, levers, motor vehicle...
2.1.2.1.3.2.5.2.	Props eg to look like council workers
2.1.2.1.3.2.6. Preventer presence/action – users	
2.1.2.1.3.2.6.1. Affected by short/med/long stay	
2.1.2.1.3.2.7. Preventer presence/perception/action – passer-by	
2.1.2.1.3.2.8. Preventer resources – passer-by	
2.1.2.1.3.2.9. Preventer presence/perception/action – guard/manager	

2.1.2.1.3.2.10. Preventer resources – guard/manager
2.1.2.1.3.2.10.1. Trained in challenge/check procedures with purported maintenance people
2.1.2.1.3.2.11. Wider opportunity structure
2.1.2.1.3.2.11.1. Market value of scrap, resale
2.1.2.1.3.2.11.2. Presence in neighbourhood (or maybe in wider region) of promoters (in wider market eg fences, unscrupulous scrapdealers, end-buyers)
2.1.2.1.3.2.11.3. Poor installation facilitates theft
2.1.2.1.4. Harm from crime
2.1.2.1.4.1. Immediate harms mediated by Design – see harms from wrecking 1.1.1.1.4
2.1.2.1.4.2. Wider harms
2.1.2.1.4.2.1. Denial of use during replacement (impact on convenience, habitual decision to cycle...)
2.1.2.1.4.2.2. Cost of repair/replacement
2.1.2.1.4.2.3. Injury from cutting or tripping
2.1.2.1.4.2.4. Incivility – generates general fear of crime
2.1.2.1.4.2.5. Incivility – generates specific perceived risk of damage/loss of bike, hence deters parking and use
2.1.2.1.4.2.6. Aesthetic degradation of site by stump or hole – environmental quality of life
2.1.2.1.4.2.7. Resale of stolen stand – manufacturer's loss of legit sale
2.1.2.1.4.2.8. Contextual influences on wider harm
2.1.2.1.4.2.8.1. Delay/difficulty in cleaning/ repair/ replacement
2.1.2.1.4.2.8.2. Especially susceptible/ fearful users of site (eg blind, elderly)
2.1.2.1.4.3. Overall severity of harms [M]
2.1.3. Mishandling
2.1.3.1. Counterfeited for sale
2.1.3.1.1. Probability of crime
2.1.3.1.1.1. Overall magnitude of probability [L] Low – ignore?

2.2. Resource for crime
2.2.1. Misused for
2.2.1.1. A climbing aid for burglary or escaping pursuing police
2.2.1.1.1. Probability of crime
2.2.1.1.1.1. Overall magnitude of probability [M]
2.2.1.1.1.2. Magnitude depends on
2.2.1.1.1.2.1. Design of product – influences on probability of crime
2.2.1.1.1.2.1.1. Affordance – visible and looks like something to climb on safely perhaps including when carrying swag
2.2.1.1.1.2.1.2. Strength
2.2.1.1.1.2.1.3. Grip-nonslip
2.2.1.1.1.2.1.4. Climb-up-ability
2.2.1.1.1.2.1.5. Climb-down-ability
2.2.1.1.1.2.2. Contextual influences on probability of crime
2.2.1.1.1.2.2.1. Environment – instrumental
2.2.1.1.1.2.2.1.1. Placement where climbing could facilitate crime by access to target enclosure – eg wall giving access to back garden
2.2.1.1.1.2.2.1.2. Poor surveillability in immediate environment from sightlines/ lighting
2.2.1.1.1.2.2.2. Environment – motivating
2.2.1.1.1.2.2.2.1. Territory of preventer – user, passer-by (?if a local) guard/manager
2.2.1.1.1.2.2.3. Offender presence
2.2.1.1.1.2.2.4. Offender perception
2.2.1.1.1.2.2.5. Offender resources - brought
2.2.1.1.1.2.2.5.1. Agility, strength, footwear, hands-free swag bag,
2.2.1.1.1.2.2.6. Preventer presence – user
2.2.1.1.1.2.2.6.1. Absence or indifference may increase risk of misuse

2.2.1.1.2.2.7.Preventer presence/perception/action – passer-by
2.2.1.1.2.2.8.Preventer resources – passer-by
2.2.1.1.2.2.9.Preventer presence/perception/action – guard/manager
2.2.1.1.2.2.10. Preventer resources – guard/manager
2.2.1.1.2.2.11. Target
2.2.1.1.2.2.11.1. Proximity of enclosures/targets for burglary or likely places for street crime (to escape from)
2.2.1.1.3. Harm from crime
2.2.1.1.3.1. Immediate harms mediated by Design of product
2.2.1.1.3.1.1.1. Criminal event: harm to product itself – susceptible to:
2.2.1.1.3.1.1.1.1. Abrasion from climbing and consequent rusting or flaking
2.2.1.1.3.1.1.1.2. Bending from climbing
2.2.1.1.3.1.1.2. Post-event: harm from design of product
2.2.1.1.3.1.1.2.1. Denial of use if bent out of shape
2.2.1.1.3.2.Wider harms
2.2.1.1.3.2.1. Wide range of harms from burglary or from successful evasion of offender from pursuers
2.2.1.1.3.3. <i>Contextual influences on wider harm</i>
2.2.1.1.3.3.1.1. ?
2.2.1.1.3.4. Overall <i>severity</i> of harms [M]
2.2.1.2. Deceptive placing of bombs
2.2.1.2.1. Probability of crime
2.2.1.2.1.1. Overall <i>magnitude of probability</i> [L]
2.2.1.2.2. <i>Magnitude depends on</i>
2.2.1.2.2.1. Design of product – influences on probability of crime
2.2.1.2.2.1.1. Possibility to hang or lean explosives container/bag on stand

2.2.1.2.2.1.2.	Possible weaponisation of stand – creates shrapnel – guides offender choice of site
2.2.1.2.2.1.3.	Visibility, audibility and obviousness of criminal intent of offender actions in placing bomb by/on stand
2.2.1.2.2.2.	Contextual influences on probability of crime
2.2.1.2.2.2.1.	Environment – instrumental
2.2.1.2.2.2.1.1.	Crowded place, many targets – value to terrorist
2.2.1.2.2.2.2.	Environment – motivating
2.2.1.2.2.2.2.1.	Provocative to offender – eg mosque provokes racist
2.2.1.2.2.2.2.2.	Territory of preventer
2.2.1.2.2.2.3.	Offender presence
2.2.1.2.2.2.3.1.	Terrorists will do hostile reconnaissance and seek out suitable places
2.2.1.2.2.2.4.	Offender perception
2.2.1.2.2.2.5.	Offender resources – brought
2.2.1.2.2.2.5.1.	Bomb, camouflage, possible fastening
2.2.1.2.2.2.5.2.	Props eg to look like council workers
2.2.1.2.2.2.6.	Offender resources – locally found
2.2.1.2.2.2.6.1.	camouflage – eg litter
2.2.1.2.2.2.7.	Promoter presence/action or inaction
2.2.1.2.2.2.8.	Preventer presence/action – user
2.2.1.2.2.2.9.	Preventer presence/perception/action – passer-by
2.2.1.2.2.2.10.	Preventer resources – passer-by
2.2.1.2.2.2.11.	Preventer presence/perception/action – guard/manager
2.2.1.2.2.2.12.	Preventer resources – guard/manager
2.2.1.2.2.2.13.	Wider opportunity structure
2.2.1.2.2.2.13.1.	Local terrorist support network

2.2.1.2.3. Harm from crime
2.2.1.2.3.1. Immediate harms mediated by Design
2.2.1.2.3.1.1.1. Criminal event: harm to product itself – product susceptible to:
2.2.1.2.3.1.1.1.1. Blast destruction (least of anyone's problems)
2.2.1.2.3.1.1.2. Post-event: harm from design of product
2.2.1.2.3.1.1.2.1. Stand weaponised – becomes shrapnel
2.2.1.2.3.2. Wider harms
2.2.1.2.3.2.1. Usual list of harms from terror attack
2.2.1.2.3.3. Contextual influences on wider harm
2.2.1.2.3.3.1.1. Numbers of people present
2.2.1.2.3.3.1.2. Accessibility for emergency services
2.2.1.2.3.4. Overall <i>severity</i> of harms [X]
2.2.2. Misbehaved with by
2.2.2.1. Climbing onto; sitting on
2.2.2.1.1. Probability of crime
2.2.2.1.1.1. Overall <i>magnitude of probability</i> [M]
2.2.2.1.2. <i>Magnitude depends on</i>
2.2.2.1.2.1. Design of product – influences on probability of crime
2.2.2.1.2.1.1. Strength, slipperiness, sit-onability, climb-up-ability, climb-down-ability
2.2.2.1.2.1.2. Visibility/appearance in self – affordance
2.2.2.1.2.2. Contextual influences on probability of crime
2.2.2.1.2.2.1. Environment – instrumental

2.2.2.1.2.2.1.1.	Configuration for climbing – eg hand brace from wall
2.2.2.1.2.2.1.2.	Configuration for sitting on – eg support from wall
2.2.2.1.2.2.1.3.	Accessibility
2.2.2.1.2.2.1.4.	Poor surveillability in immediate environment from sightlines/ lighting
2.2.2.1.2.2.1.5.	Defensibility
2.2.2.1.2.2.2.	Environment – motivating
2.2.2.1.2.2.2.1.1.	Lack of legitimate entertainment supplies time and causes readiness to offend
2.2.2.1.2.2.2.1.2.	Image of area prompts misbehaviour
2.2.2.1.2.2.2.1.3.	Availability of alcohol disinhibits behaviour
2.2.2.1.2.2.2.2.	Territory of preventer
2.2.2.1.2.2.3.	Offender presence
2.2.2.1.2.2.4.	Offender perception
2.2.2.1.2.2.5.	Promoter presence/action or inaction
2.2.2.1.2.2.5.1.	Regular presence of rowdy youngsters prompts, pressures or provokes misbehaviour
2.2.2.1.2.2.6.	Preventer presence/action – user
2.2.2.1.2.2.7.	Preventer presence/perception/action – passer-by
2.2.2.1.2.2.8.	Preventer resources – passer-by
2.2.2.1.2.2.9.	Preventer presence/perception/action – guard/manager
2.2.2.1.2.2.10.	Preventer resources – guard/manager
2.2.2.1.3.	Harm from crime
2.2.2.1.3.1.	Immediate harms mediated by Design
2.2.2.1.3.1.1.1.	Criminal event: harm to product itself – product susceptible to:
2.2.2.1.3.1.1.2.	Post-event: harm from design of product
2.2.2.1.3.1.1.2.1.	As per climbing aid 1211

2.2.2.1.3.2. Wider harms
2.2.2.1.3.2.1. Noise, nuisance and general misbehaviour
2.2.2.1.3.3. Contextual influences on wider harm
2.2.2.1.3.3.1.1. Passers-by, residents, shops disturbed/disrupted
2.2.2.1.3.3.1.2. Perceived threat from gathering/ playing youths
2.2.2.1.3.3.1.3. Accidental damage from gathering/ playing youths
2.2.2.1.3.3.1.4. Injury from/to gathering/playing youths
2.2.2.1.3.3.1.5. Conflict from/among gathering/ playing youths – eg if stand is located on border between 2 gangs
2.2.2.1.3.4. Overall severity of harms [M]
2.2.2.2. Bashing to make noise
2.2.2.2.1. Probability of crime
2.2.2.2.1.1. Overall magnitude of probability [M]
2.2.2.2.2. Magnitude depends on
2.2.2.2.2.1. Design of product – influences on probability of crime
2.2.2.2.2.1.1. Resonance of stand and quality of anchorage
2.2.2.2.2.1.2. Visibility/appearance in self – affordance
2.2.2.2.2.2. Contextual influences on probability of crime
2.2.2.2.2.2.1. Environment – instrumental
2.2.2.2.2.2.1.1. Acoustics – good sound/echo
2.2.2.2.2.2.1.2. Accessibility
2.2.2.2.2.2.1.3. Poor surveillability in immediate environment from sightlines/ lighting
2.2.2.2.2.2.2. Environment – motivating
2.2.2.2.2.2.2.1.1. Lack of legitimate entertainment supplies time and causes readiness to offend
2.2.2.2.2.2.2.1.2. Image of area prompts misbehaviour

2.2.2.2.2.2.1.3. Availability of alcohol disinhibits behaviour
2.2.2.2.2.2.2. Territory of preventer
2.2.2.2.2.2.3. Offender presence
2.2.2.2.2.2.4. Offender perception
2.2.2.2.2.2.5. Offender resources – brought
2.2.2.2.2.2.6. Offender resources – locally found
2.2.2.2.2.2.6.1. Sticks, stones, piping...
2.2.2.2.2.2.7. Promoter presence/action or inaction
2.2.2.2.2.2.7.1. Regular presence of rowdy youngsters prompts, pressures or provokes misbehaviour
2.2.2.2.2.2.8. Preventer presence/action – users
2.2.2.2.2.2.9. Preventer presence/perception/action – passer-by
2.2.2.2.2.2.10. Preventer resources – passer-by
2.2.2.2.2.2.11. Preventer presence/perception/action – guard/manager
2.2.2.2.2.2.12. Preventer resources – guard/manager
2.2.2.2.3. Harm from crime
2.2.2.2.3.1. Immediate harms mediated by Design
2.2.2.2.3.1.1.1. Criminal event: harm to product itself – product susceptible to:
2.2.2.2.3.1.1.1.1. bending/denting/abrasion
2.2.2.2.3.1.1.2. Post-event: harm from design of product
2.2.2.2.3.1.1.2.1. As per climbing aid 1211
2.2.2.2.3.2. Wider harms
2.2.2.2.3.2.1. Noise, nuisance and general misbehaviour
2.2.2.2.3.3. Contextual influences on wider harm
2.2.2.2.3.3.1.1. Passers-by, residents, shops disturbed/disrupted

2.2.2.2.3.3.1.2.	Perceived threat from gathering/ playing youths
2.2.2.2.3.3.1.3.	Accidental damage from gathering/ playing youths
2.2.2.2.3.3.1.4.	Injury from/to gathering/playing youths
2.2.2.2.3.3.1.5.	Conflict from/among gathering/ playing youths – eg if stand is located on border between 2 gangs
2.2.2.2.3.4.	Overall <i>severity</i> of harms [M]
2.3. Mistake (not covered by CCO – M&S only)	
2.3.1. Mistake	
2.3.1.1. Source of false alarm of terrorism (as with suspicious object leaning against or hanging on stand)	
2.3.1.1.1.	Probability of event
2.3.1.1.1.1.	Overall <i>magnitude of probability</i> [L]
2.3.1.1.2.	<i>Magnitude depends on</i>
2.3.1.1.2.1.	Design of product – influences on probability of event
2.3.1.1.2.1.1.	Possibility to hang or lean container/bag on stand, which <i>could</i> contain explosives
2.3.1.1.2.2.	Contextual influences on probability of event
2.3.1.1.2.2.1.	Environment – instrumental
2.3.1.1.2.2.1.1.	Crowded place, many targets – value to terrorist
2.3.1.1.2.2.2.	Environment – motivating
2.3.1.1.2.2.2.1.	Provocative to offender – eg mosque provokes racist
2.3.1.1.3.	Harm from crime
2.3.1.1.3.1.	Immediate harms mediated by Design
2.3.1.1.3.1.1.	Criminal event: harm to product itself – product susceptible to preventive detonation by security services
2.3.1.1.3.2.	Wider harms

2.3.1.1.3.2.1. Usual disruptions from a terror false alarm

2.3.1.1.3.3. **Contextual** influences on wider harm

2.3.1.1.3.3.1.1. What/who are nearby to be disrupted – eg major transport interchange, home for elderly to be evacuated

2.3.1.1.3.4. Overall *severity* of harms [M]

Defacement by shooting/stoning (sign panels)

Criminal events,
their probability and harm,
and the design and contextual factors influencing these
for a given designed object or place

3. Furniture in-function - Bike-lock-stand complex

note that lock could be brought by user and/or a captive lock incorporated within the stand, perhaps also connected to a stand-based cash or card-based money collection system. More than one bike could be lockable to the stand.

3.1. Bike and its components as target of crime

3.1.1. Mistreatment of bike [could follow from misbehaviour]

3.1.1.1. Deliberate damage to bike

3.1.1.1.1. Details of *Perp Technique/s*

3.1.1.1.1.1. Bike damaged for expressive reasons [could be instrumental for a school protection racket I suppose!]

3.1.2. Misappropriation of entire bike

3.1.2.1. Theft of bike by detaching stand from anchorage

3.1.2.1.1. Details of *Perp Technique/s*

3.1.2.1.1.1. Unbolt stand; dig out stand foundation; perhaps pre-loosen covertly before bike is parked. Lock may need to be slid off detached stand.

3.1.2.1.2. Probability of crime
3.1.2.1.2.1. Overall <i>magnitude of probability</i> [M]
3.1.2.1.2.2. <i>Magnitude depends on</i>
3.1.2.1.2.2.1. Design of BLS complex – influences on probability of crime
3.1.2.1.2.2.1.1. Design of anchorage – see 112131. Note that stand could be stolen for own value, leaving bike unprotected
3.1.2.1.2.2.1.2. How far tampering is evident to preventer (user, guard, manager)
3.1.2.1.2.2.1.3. Visibility, audibility and obviousness of criminal intent of offender actions in detaching stand
3.1.2.1.2.2.1.4. Space within the complex eg between bike and stand, to deploy tools
3.1.2.1.2.2.2. Contextual influences on probability of crime
3.1.2.1.2.2.2.1. Environment – instrumental
3.1.2.1.2.2.2.1.1. Accessibility
3.1.2.1.2.2.2.1.2. Space – to undertake action
3.1.2.1.2.2.2.1.3. Surveillability in immediate environment from sightlines/ lighting
3.1.2.1.2.2.2.1.4. Defensibility (in absence of designed enclosure)
.....1.4.1 Barriers etc configured so offender cannot get near enough for above instrumental-environment purposes
3.1.2.1.2.2.2.2. Environment – motivating
3.1.2.1.2.2.2.2.1. Territoriality of preventers
3.1.2.1.2.2.2.3. Offender presence
3.1.2.1.2.2.2.4. Offender perception
3.1.2.1.2.2.2.5. Offender resources – brought
3.1.2.1.2.2.2.5.1. Cutters, drills, spanners, levers
3.1.2.1.2.2.2.5.2. Props eg to look like council workers
3.1.2.1.2.2.2.6. Offender resources – locally found

3.1.2.1.2.2.2.6.1. Levers – eg tree stakes
3.1.2.1.2.2.2.7. Promoter presence/perception/action or inaction
3.1.2.1.2.2.2.7.1. Failure of management to properly install/check/maintain anchorage
3.1.2.1.2.2.2.8. Preventer presence/perception/action - user
3.1.2.1.2.2.2.9. How long user leaves bike
3.1.2.1.2.2.3.Preventer presence/perception/action – passer-by
3.1.2.1.2.2.4.Preventer resources – passer-by
3.1.2.1.2.2.5.Preventer presence/perception/action – guard/manager
3.1.2.1.2.2.6.Preventer resources – guard/manager
3.1.2.1.2.2.6.1. Preventer resources
3.1.2.1.2.2.6.1.1. Knowledge of Perp Technique/s hence alertness to pre-loosening
3.1.2.1.2.2.6.1.2. Security product – lock
... 2.1 lock can be slid off broken/detached from stand
3.1.2.1.2.2.6.2. Target – Bike
3.1.2.1.2.2.6.2.1. Valuable
3.1.2.1.2.2.6.2.2. Susceptible to removal
3.1.2.1.2.3. Wider opportunity structure
3.1.2.1.2.3.1. Market for stolen bikes conveniently near
3.1.2.1.2.3.2. Inadequate registration/identification system/ use of such system
3.1.2.1.3. Harm from crime
3.1.2.1.3.1. Immediate harms mediated by Design of product
3.1.2.1.3.1.1.1. Criminal event: harm to product itself – complex susceptible to:
3.1.2.1.3.1.1.1.1. Damage to stand from detaching

3.1.2.1.3.1.1.1.2. Damage to ground from detaching
3.1.2.1.3.1.1.1.3. Damage to bike from sliding off
3.1.2.1.3.1.1.2. Post-event: harm from design of complex
3.1.2.1.3.1.1.2.1. As per wrecking, abrasion
3.1.2.1.3.1.1.2.2. Damaged bike may be unsafe
3.1.2.1.3.2. Wider harms
3.1.2.1.3.2.1. Loss of bike
3.1.2.1.3.2.1.1. Cost and effort to replace
3.1.2.1.3.2.1.2. Sentimental loss
3.1.2.1.3.2.1.3. Public costs – Police, CJS
3.1.2.1.3.2.1.4. Public costs – less cycling, more use of other less sustainable transport
3.1.2.1.3.3. Contextual influences on wider harm
3.1.2.1.3.4. Overall <i>severity</i> of harms [H]
3.1.2.2. Theft of bike by cutting stand
3.1.2.2.1. Details of Perp Technique/s
3.1.2.2.1.1. Stand is cut and/or bent to release lock + bike
3.1.2.2.2. Probability of crime
3.1.2.2.2.1. Overall <i>magnitude of probability</i> [L]
3.1.2.2.2.2. <i>Magnitude depends on</i>
3.1.2.2.2.2.1. Design of products/complex – influences on probability of crime
3.1.2.2.2.2.1.1. Non-susceptibility to cutting (and perhaps to bending if only a single cut possible) – including time taken to cut through. Target softening – eg tube swivels with movement of saw.
3.1.2.2.2.2.1.2. Visibility, audibility and obviousness of criminal intent of offender actions in cutting stand
3.1.2.2.2.2.1.3. Space within the complex eg between bike and stand, to deploy tools

3.1.2.2.2.2.2. Contextual influences on probability of crime
3.1.2.2.2.2.1. Environment – instrumental
3.1.2.2.2.2.1.1. Accessibility
3.1.2.2.2.2.1.2. Space – to undertake action
...2.1 Between stand and wall
3.1.2.2.2.2.1.3. Surveillability in immediate environment
3.1.2.2.2.2.1.4. Defensibility
...4.1 Barriers etc configured so offender cannot get near enough for above instrumental-environment purposes
3.1.2.2.2.2.2. Environment – motivating
3.1.2.2.2.2.2.1. Territoriality of preventers
3.1.2.2.2.2.2.3. Offender presence
3.1.2.2.2.2.2.4. Offender perception
3.1.2.2.2.2.2.5. Offender resources – brought
3.1.2.2.2.2.2.5.1. Cutting tools; light source
3.1.2.2.2.2.2.5.2. Sound deadening kit
3.1.2.2.2.2.2.5.3. Props eg to look like council workers
3.1.2.2.2.2.2.6. Offender resources – locally found
3.1.2.2.2.2.2.6.1. Lever to open up cut
3.1.2.2.2.2.2.7. Promoter presence/perception/action or inaction
3.1.2.2.2.2.2.8. Preventer presence/perception/action - user
3.1.2.2.2.2.2.8.1. Locking behaviour – lock deployed properly to deny offender operating space or make action and criminal intent obvious
3.1.2.2.2.2.2.8.2. Surveillance – spotting/ recognition of criminal intent
3.1.2.2.2.2.2.9. Preventer resources – user

3.1.2.2.2.2.10.	Surveillance – knowledge of how to challenge intent and action to take if criminal
3.1.2.2.2.2.11.	Lock – unaffected by cut stand
3.1.2.2.2.2.11.1.	Preventer presence/perception/action – passer-by
3.1.2.2.2.2.11.2.	Preventer resources – passer-by
3.1.2.2.2.2.11.3.	Preventer presence/perception/action – guard/manager
3.1.2.2.2.2.11.4.	Preventer resources – guard/manager
3.1.2.2.2.3.	Target - bike as lever to open up cut
3.1.2.2.3.	Wider opportunity structure
3.1.2.2.3.1.	Supply of high performance cutting tools
3.1.2.2.3.	Harm from crime
3.1.2.2.3.1.	Immediate harms mediated by Design of product
3.1.2.2.3.1.1.1.	Criminal event: harm to complex itself – products susceptible to:
3.1.2.2.3.1.1.1.1.	Damage to stand from cutting
3.1.2.2.3.1.1.1.2.	Damage to ground from bending stand
3.1.2.2.3.1.1.1.3.	Damage to bike from sliding off
3.1.2.2.3.1.1.2.	Post-event: harm from design of complex
3.1.2.2.3.1.1.2.1.	As per wrecking, abrasion
3.1.2.2.3.1.1.2.2.	Damaged bike may be unsafe
3.1.2.2.3.2.	Contextual influences on wider harm
3.1.2.2.3.3.	Overall severity of harms [M]
3.1.2.3. Theft of bike by breaking lock	
3.1.2.3.1.	Details of Perp Technique/s
3.1.2.3.1.1.	Lock is broken/cut to release bike
3.1.2.3.2.	Probability of crime

3.1.2.3.2.1. Overall <i>magnitude of probability</i> [H]
3.1.2.3.2.2. <i>Magnitude depends on</i>
3.1.2.3.2.2.1. Design/configuration of complex – influences on probability of crime
3.1.2.3.2.2.1.1. Space to insert tool, apply cutter or leverage or other force in right point/ direction/ strength
3.1.2.3.2.2.1.2. Close-in sightlines to guide these offender actions
3.1.2.3.2.2.1.3. Resistance of configuration, to aid application of this force to desired point
3.1.2.3.2.2.1.4. Action has no obvious/unambiguous criminal intent
3.1.2.3.2.2.1.5. Concealment of action by body of bike
3.1.2.3.2.2.2. Contextual influences on probability of crime
3.1.2.3.2.2.2.1. Target
3.1.2.3.2.2.2.1.1. Bike misused as lever to break lock
3.1.2.3.2.2.2.2. Environment – instrumental
3.1.2.3.2.2.2.2.1. Accessibility
3.1.2.3.2.2.2.2.2. Space – to undertake action
3.1.2.3.2.2.2.2.3. Surveillability in immediate environment
...1.3.1 Enough light for offender to see type of lock and where to bring force to bear
3.1.2.3.2.2.2.2.4. Defensibility
...1.4.1 Barriers etc configured so offender cannot get near enough for above instrumental-environment purposes
3.1.2.3.2.2.2.3. Offender presence
3.1.2.3.2.2.2.4. Offender perception
3.1.2.3.2.2.2.5. Offender resources – brought
3.1.2.3.2.2.2.5.1. Cutter, lever, drill, hammer, chisel; light source
3.1.2.3.2.2.2.6. Offender resources – locally found

3.1.2.3.2.2.6.1. Lever, hammer (rock, brick)
3.1.2.3.2.2.7. Promoter presence/perception/action or inaction (here = careless, ignorant or impoverished user who could be turned into a preventer)
3.1.2.3.2.2.7.1. Inadequate choice of lock/s
3.1.2.3.2.2.7.2. Inadequate deployment/ positioning of locks
3.1.2.3.2.2.8. Preventer resources – user
3.1.2.3.2.2.8.1. Inadequate lock – weak
3.1.2.3.2.2.8.2. Too few locks
3.1.2.3.2.2.8.3. Inadequate knowledge of locks and ways to use them
3.1.2.3.2.3. Preventer presence/perception/action – passer-by
3.1.2.3.2.4. Preventer resources – passer-by
3.1.2.3.2.5. Preventer presence/perception/action – guard/manager
3.1.2.3.2.6. Preventer resources – guard/manager
3.1.2.3.2.6.1. Wider opportunity structure
3.1.2.3.2.6.1.1. Availability of suitable tools
3.1.2.3.3. Harm from crime
3.1.2.3.3.1. Immediate harms mediated by Design of product/complex
3.1.2.3.3.1.1.1. Criminal event: harm to product/complex itself – product susceptible to:
3.1.2.3.3.1.1.1.1. Abrasion or bending to bike and stand
3.1.2.3.3.1.1.2. Post-event: harm from design of product/complex
3.1.2.3.3.1.1.2.1. Injury to users or passers-by from broken lock
3.1.2.3.3.1.1.2.2. Litter from lock remains
3.1.2.3.3.2. Wider harms
3.1.2.3.3.2.1. Incivilities – as under damage to furniture
3.1.2.3.3.2.2. Cyclists specifically deterred from using cycle stands by perceived risk – fly parking in apparently safer places?

3.1.2.3.3.2.3. Cyclists deterred from cycling altogether
3.1.2.3.3.3. Contextual influences on wider harm
3.1.2.3.3.4. Overall severity of harms [H]
3.1.2.4. Theft of bike by picking lock [main interest here is in how the configuration facilitates this; less interest in design of lock per se, unless the lock is a captive component of the stand]
3.1.2.4.1. Details of Perp Technique/s
3.1.2.4.1.1. Lock is picked to release bike
3.1.2.4.2. Probability of crime
3.1.2.4.2.1. Overall <i>magnitude of probability</i> [H]
3.1.2.4.2.2. <i>Magnitude depends on</i>
3.1.2.4.2.2.1. Design of product – influences on probability of crime
3.1.2.4.2.2.1.1. Mechanism of lock is pickable
3.1.2.4.2.2.1.2. Configuration of lock+stand+bike allows access, space, sight and application of necessary force for use of lock-picking tools
3.1.2.4.2.2.2. Contextual influences on probability of crime
3.1.2.4.2.2.2.1. Environment – instrumental
3.1.2.4.2.2.2.1.1. Accessibility
3.1.2.4.2.2.2.1.2. Space – to undertake action
3.1.2.4.2.2.2.1.3. Surveillability in immediate environment
3.1.2.4.2.2.2.1.4. Defensibility
3.1.2.4.2.2.2.2. Environment – motivating
3.1.2.4.2.2.2.3. Offender presence
3.1.2.4.2.2.2.4. Offender perception
3.1.2.4.2.2.2.5. Offender resources – brought

3.1.2.4.2.2.2.5.1.	Knowledge of different kinds of locks, their susceptibilities, how to pick them
3.1.2.4.2.2.2.5.2.	Lock-picking tools (the more obvious these are required to be, perhaps by virtue of the design of the lock, the more the risk to the offender of being arrested for going equipped); light source
3.1.2.4.2.2.2.5.3.	Props to look like plausible user, maintenance personnel etc
3.1.2.4.2.2.2.6.	Promoter presence/perception/action or inaction
3.1.2.4.2.2.2.6.1.	Incomplete/improper/entirely omitted locking sequence
3.1.2.4.2.2.2.7.	Preventer presence/perception/action – user
3.1.2.4.2.2.2.8.	Preventer resources – user
3.1.2.4.2.2.2.8.1.	Knowledge of operating sequence
3.1.2.4.2.2.2.8.2.	Knowledge of crime risks; perhaps of perpetrator techniques involving lock picking
3.1.2.4.2.2.2.8.3.	Knowledge and possession of appropriate locks
3.1.2.4.2.2.2.9.	Preventer presence/perception/action – passer-by
3.1.2.4.2.2.2.10.	Preventer resources – passer-by
3.1.2.4.2.2.2.11.	Preventer presence/perception/action – guard/manager
3.1.2.4.2.2.2.12.	Preventer resources – guard/manager
3.1.2.4.2.2.3.	Wider opportunity structure
3.1.2.4.2.2.3.1.	Availability of lock-picking tools, knowledge of susceptibilities etc
3.1.2.4.3.	Harm from crime
3.1.2.4.3.1.	Immediate harms mediated by Design of product
3.1.2.4.3.1.1.1.	Criminal event: harm to product itself – product susceptible to:
3.1.2.4.3.1.1.1.1.	Damage to lock
3.1.2.4.3.1.1.1.2.	Damage to other elements in order to gain access to lock and apply tools
3.1.2.4.3.1.1.2.	Post-event: harm from design of product
3.1.2.4.3.1.1.2.1.	With captive lock, stand may be unlockable until repaired

3.1.2.4.3.1.1.2.2.	With lock non-functional but showing no evidence of tampering, new users may falsely think their bike is secure
3.1.2.4.3.2.	Wider harms
3.1.2.4.3.2.1.	With captive lock, user ceases to trust the stand and may stop using it, or bring own lock which causes damage or is a nuisance eg if bike needs to be removed by personnel
3.1.2.4.3.3.	Contextual influences on wider harm
3.1.2.4.3.4.	?
3.1.2.4.3.5.	Overall severity of harms [H]
3.1.2.5. Hijacking of bike at point of user locking or unlocking it	
3.1.2.5.1.	Details of Perp Technique/s
3.1.2.5.1.1.	Robber seizes bike while it is unlocked, but cyclist is dismounted and possibly distracted with parking procedures
May fill this in but in many respects similar to Robbing cyclist at point of parking , below	
3.1.2.6. Theft of bike components and add-ons	
3.1.2.6.1.	Details of Perp Technique/s
3.1.2.6.1.1.	Wheels, saddle, mudguards etc removed leaving bike frame in place; or frame removed leaving wheel in place; unsecured items eg lights, pump, helmet removed leaving bike in place
3.1.2.6.2.	Probability of crime
3.1.2.6.2.1.	Overall <i>magnitude of probability</i> [H]
3.1.2.6.2.2.	<i>Magnitude depends on</i>
3.1.2.6.2.2.1.	Design of complex – influences on probability of crime
3.1.2.6.2.2.1.1.	Bike – ease of removability of components/add-ons [not taken further here] – by undoing or breaking
3.1.2.6.2.2.1.2.	Lock/locks

3.1.2.6.2.2.1.2.1. Extent to which they protect the components/add-ons (eg with cable or protrusions of arms threaded through)
3.1.2.6.2.2.1.2.2. Security of lock itself (see breaking, picking above)
3.1.2.6.2.2.1.3. Stand and configuration as a whole
3.1.2.6.2.2.1.3.1. Extent of access to components/add-ons to enable undoing/breaking, and their removal once freed from bike
3.1.2.6.2.2.2. Contextual influences on probability of crime
3.1.2.6.2.2.2.1. Target
3.1.2.6.2.2.2.1.1. Components hard to conceal when escaping; add-ons may be easy to conceal
3.1.2.6.2.2.2.1.2. Items non-traceable (no property marking/registration)
3.1.2.6.2.2.2.2. Environment – instrumental
3.1.2.6.2.2.2.2.1. Accessibility
3.1.2.6.2.2.2.2.2. Space – to undertake action
3.1.2.6.2.2.2.2.3. Surveillability in immediate environment
3.1.2.6.2.2.2.2.4. Defensibility
3.1.2.6.2.2.2.3. Offender presence
3.1.2.6.2.2.2.4. Offender perception
3.1.2.6.2.2.2.5. Offender resources – brought
3.1.2.6.2.2.2.5.1. Tools – for undoing and/or cutting and breaking; light source
3.1.2.6.2.2.2.5.2. Knowledge of ways to undo or otherwise release components
3.1.2.6.2.2.2.6. Offender resources – locally found
3.1.2.6.2.2.2.7. Promoter presence/perception/action or inaction
3.1.2.6.2.2.2.7.1. Owner's choice of bike with easily removed components or add-ons
3.1.2.6.2.2.2.7.2. Owner's failure to remove components/add-ons on leaving bike
3.1.2.6.2.2.2.8. Preventer presence/perception/action – user
3.1.2.6.2.2.2.9. Preventer resources – user

3.1.2.6.2.2.2.9.1. Knowledge of risks and preventive actions
3.1.2.6.2.2.2.9.2. Pockets to carry add-ons in, place to store removed wheels etc
3.1.2.6.2.2.2.10. Preventer presence/perception/action – passer-by
3.1.2.6.2.2.2.11. Preventer resources – passer-by
3.1.2.6.2.2.2.12. Preventer presence/perception/action – guard/manager
3.1.2.6.2.2.2.13. Preventer resources – guard/manager
3.1.2.6.2.2.3. Wider opportunity structure
3.1.2.6.2.2.3.1. Market for components/ add-ons
3.1.2.6.3. Harm from crime
3.1.2.6.3.1. Immediate harms mediated by Design of product
3.1.2.6.3.1.1.1. Criminal event: harm to product itself – product susceptible to:
3.1.2.6.3.1.1.1.1. Damage during removal – to remainder of bike, to stand
3.1.2.6.3.1.1.2. Post-event: harm from design of product/complex
3.1.2.6.3.1.1.2.1. ?
3.1.2.6.3.2. Wider harms
3.1.2.6.3.2.1. Safety issues – no lights, flat tyres, remaining components may be loose/distorted
3.1.2.6.3.2.2. Bike unrideable
3.1.2.6.3.2.3. Costs of theft
3.1.2.6.3.3. Contextual influences on wider harm
3.1.2.6.3.3.1. Where/how user has to travel to; whether day or night
3.1.2.6.3.4. Overall severity of harms [4]
3.1.3. Misuse

3.1.3.1. Theft of bike
3.1.3.1.1. Details of Perp Technique/s
3.1.3.1.1.1. Using bike as lever to break lock [covered elsewhere]
3.2. Parking money as target of crime [if payment system built into stand]
3.2.1. Mishandling
3.2.1.1. Fraud with parking money
3.2.1.1.1. Details of Perp Technique/s
3.2.1.1.1.1. A wide range of methods of offending (with associated resources) depending on exact details of money-collection system – mechanical, electronic procedural. Goal is either to obtain cash from machine/legitimate users, or to fraudulently obtain free bike parking.
Use generic risk entries to work out the risk possibilities and influence of design and context – eg environment-instrumental-surveillability
3.2.2. <u>Misappropriation</u> with mistreatment of installation and/or users
3.2.2.1. Theft of money by breaking into coin operated mechanism
3.2.2.1.1. Details of Perp Technique/s
3.2.2.1.1.1. Breaking open the cash box in any coin-operated parking mechanism
3.2.2.1.2. Probability of crime
3.2.2.1.2.1. Overall <i>magnitude of probability</i> [M]
3.2.2.1.2.2. <i>Magnitude depends on</i>

3.2.2.1.2.2.1. Design of product – influences on probability of crime
3.2.2.1.2.2.1.1. Cash box component
3.2.2.1.2.2.1.1.1. Cash rather than card payment
3.2.2.1.2.2.1.1.2. Susceptibility - can be prised open with reasonably available tools; points of application of force can be seen
3.2.2.1.2.2.1.1.3. Looks insufficiently robust so offender not discouraged
3.2.2.1.2.2.1.1.4. Value - stores sufficient money (and appears to do so) to make it worth offender's while
3.2.2.1.2.2.1.2. Rest of complex
3.2.2.1.2.2.1.2.1. Accessibility to susceptible parts of cash box
3.2.2.1.2.2.1.2.2. Space to apply tools to cash box
3.2.2.1.2.2.1.2.3. Light and sightlines to see action point
3.2.2.1.2.2.1.2.4. Prospect – Immediate sightlines to avoid being surprised at work by potential preventers
3.2.2.1.2.2.1.2.5. Concealment – of body or of actions of offender from potential surveillance by preventers (users, guards, managers, passers-by, police)
3.2.2.1.2.2.2. Contextual influences on probability of crime
3.2.2.1.2.2.2.1. Environment – instrumental
3.2.2.1.2.2.2.1.1. Accessibility
3.2.2.1.2.2.2.1.2. Space – to undertake action
3.2.2.1.2.2.2.1.3. Surveillability in immediate environment
3.2.2.1.2.2.2.1.4. Defensibility
3.2.2.1.2.2.2.2. Offender perception
3.2.2.1.2.2.2.3. Offender resources – brought
3.2.2.1.2.2.2.3.1. Knowledge of cashboxes of particular types – likely content, susceptibilities
3.2.2.1.2.2.2.3.2. Tools – prising, levering, drilling, cutting...
3.2.2.1.2.2.2.3.3. Props and explanations to alleviate suspicion and disarm challenge

3.2.2.1.2.2.2.4. Promoter presence/perception/action or inaction
3.2.2.1.2.2.2.4.1. Infrequent cash collection builds up money
3.2.2.1.2.2.2.5. Preventer presence/perception/action – user
3.2.2.1.2.2.2.5.1. Surveillance – spotting of suspicious behaviour, and response
3.2.2.1.2.2.2.6. Preventer resources – user
3.2.2.1.2.2.2.6.1. Knowledge of offender’s perpetrator technique empowers surveillance and challenge
3.2.2.1.2.2.2.7. Preventer presence/perception/action – passer-by
3.2.2.1.2.2.2.8. Preventer resources – passer-by
3.2.2.1.2.2.2.9. Preventer presence/perception/action – guard/manager
3.2.2.1.2.2.2.10. Preventer resources – guardmanager
3.2.2.1.2.2.2.11. Wider opportunity structure
3.2.2.1.2.2.2.11.1. Availability of tools, knowhow
3.2.2.1.3. Harm from crime
3.2.2.1.3.1. Immediate harms mediated by Design of product
3.2.2.1.3.1.1.1. Criminal event: harm to product itself – product susceptible to:
3.2.2.1.3.1.1.1.1. Damage – no longer functions
3.2.2.1.3.1.1.2. Post-event: harm from design of product
3.2.2.1.3.1.1.2.1. Lock may cease to function
3.2.2.1.3.1.1.2.2. Revenue loss
3.2.2.1.3.2. Wider harms
3.2.2.1.3.2.1. Reduced revenue jeopardises financial viability of service
3.2.2.1.3.3. Contextual influences on wider harm
3.2.2.1.3.4. Overall severity of harms [H] ?relative to all possible bike-related crimes, or to all crimes in general?

3.2.2.2. Robbing cyclist at point of parking	
3.2.2.2.1. Details of Perp Technique/s	
3.2.2.2.1.1.	Robber surprises parking cyclist when gets out money (or card) to pay... steals money, card, wallet or handbag. Note – robbery could also take place in absence of payment requirement, just using distraction of cyclist with parking procedure
3.2.2.2.2. Probability of crime	
3.2.2.2.2.1. Overall <i>magnitude of probability</i> [1]	
3.2.2.2.2.2. <i>Magnitude depends on</i>	
3.2.2.2.2.2.1. Design of product/complex – influences on probability of crime	
3.2.2.2.2.2.1.1.	Possibilities for script clash – ambush/surprise v on-guard – eg parking cyclist required to turn back on pavement space when inserting money or card
3.2.2.2.2.2.1.2.	Extent to which complex impedes view of user
3.2.2.2.2.2.1.3.	Slow/fast to make payment – how long is cash exposed, user distracted by procedure?
3.2.2.2.2.2.1.4.	Extent to which complex corners the user
3.2.2.2.2.2.1.5.	Extent to which complex corners the offender
3.2.2.2.2.2.1.6.	Defensibility – can user employ the complex as a barrier to separate self from robber?
3.2.2.2.2.2.1.7.	Defensibility – can robber employ the complex as a barrier to separate self from 'dangerous prey' or from other potential preventers?
3.2.2.2.2.2.2. Contextual influences on probability of crime	
3.2.2.2.2.2.2.1. Target	
3.2.2.2.2.2.2.1.1. Cyclist – unlikely to resist? Wealthy?	
3.2.2.2.2.2.2.1.2. Sufficient potential targets using site to make it worth waiting	
3.2.2.2.2.2.2.1.3. Cyclist's cash	
3.2.2.2.2.2.2.2. Environment – instrumental	
3.2.2.2.2.2.2.2.1. Accessibility	

.....2.1.1. Script clash – cyclist cornered in wider environment v able to escape
.....2.1.2. Script clash – robber’s risk of being cornered and evading pursuit v users or others pursuing/holding them
3.2.2.2.2.2.2.2. Space – to undertake action
.....2.2.1 Robber needs to keep some space between himself and victim – ‘dangerous prey’
3.2.2.2.2.2.2.3. Surveillability in immediate environment
...2.3.1. Could others see robbery taking place?
...2.3.2. Could offender see others approaching?
...2.3.4 CCTV cover?
3.2.2.2.2.2.2.4. Defensibility
3.2.2.2.2.2.3. Offender presence
3.2.2.2.2.2.3.1. Is this an area where many potential offenders present/passing – eg high incidence of drug misuse?
3.2.2.2.2.2.3.2. Does wider context give excuse for offender presence – eg apparently waiting at nearby bus stop?
3.2.2.2.2.2.4. Offender perception
3.2.2.2.2.2.5. Offender resources – brought
3.2.2.2.2.2.5.1. Weapon, strength/dangerous appearance (but this needs to be turned off when lurking or perhaps escaping)
3.2.2.2.2.2.5.2. Props and behaviours to lull suspicion
3.2.2.2.2.2.5.3. Distraction/shock/intimidation/control tactics
3.2.2.2.2.2.5.4. Speed of action
3.2.2.2.2.2.5.5. Escape tactics
3.2.2.2.2.2.5.6. Familiarity with parking complex and wider environment

3.2.2.2.2.2.6. Offender resources – locally found
3.2.2.2.2.2.6.1. Ad-hoc weapons
3.2.2.2.2.2.7. Promoter presence/perception/action or inaction
3.2.2.2.2.2.7.1. User fails to pay attention to people and surroundings
3.2.2.2.2.2.7.2. User adopts insecure money-handling procedures eg waving fat wallet around
3.2.2.2.2.2.8. Preventer presence/perception/action – user
3.2.2.2.2.2.8.1. Absence of potential challengers or interveners
3.2.2.2.2.2.9. Preventer resources – user/victim
3.2.2.2.2.2.9.1. Ability to fight, summon help eg with voice or alarm, pursue, identify offender
3.2.2.2.2.2.10. Preventer presence/perception/action – passer-by
3.2.2.2.2.2.11. Preventer resources – passer-by
3.2.2.2.2.2.12. Preventer presence/perception/action – guard/manager
3.2.2.2.2.2.13. Preventer resources – guard/manager
3.2.2.2.2.2.13.1. Alarm to distract robber, summon assistance
3.2.2.2.2.3. Wider opportunity structure
3.2.2.2.2.3.1. Market for stolen cards etc
3.2.2.2.3. Harm from crime
3.2.2.2.3.1. Immediate harms mediated by Design of product
3.2.2.2.3.1.1. Cash/card requirement contributes to loss of these, with various knock-on consequences
3.2.2.2.3.1.1.1. Criminal event: harm to product/complex itself – susceptible to:
3.2.2.2.3.1.1.1.1. Damage during scuffle, escape
3.2.2.2.3.1.1.2. Post-event: harm from design of product
3.2.2.2.3.1.1.2.1. As per deliberate damage
3.2.2.2.3.2. Wider harms

3.2.2.2.3.2.1. All usual harms caused by robbery to individuals including trauma and possible injury
3.2.2.2.3.2.2. Collective harms to area reputation, fear of crime etc
3.2.2.2.3.2.3. Unwillingness to use cycle facility
3.2.2.2.3.3. Contextual influences on wider harm
3.2.2.2.3.3.1. People particularly susceptible/vulnerable – elderly, young...
3.2.2.2.3.3.2. Things to bump into, to fall onto when being pushed
3.2.2.2.3.4. Overall severity of harms [H] ?relative to all possible bike-related crimes, or to all crimes in general?
4.
4.1.1.1. Robbing cash collector
4.1.1.1.1. Details of Perp Technique/s
4.1.1.1.1.1. Robber surprises cash collector when arrives to empty cash box
Similar to robbing user but preventer will have more resources and maybe co-preventer. Will depend on design of cash box removal design and procedure
4.1.2. Bike-lock-stand complex as Environment of crime
4.1.3. Misbehaviour
4.1.3.1. Conflict over parking – bike jam
4.1.3.1.1. Details of how crime unfolds
4.1.3.1.1.1. Bikes secured either side of 1 stand could damage or block removal of each other, leading to conflict between users, resulting in insult, injury, damage, retaliatory theft...
4.1.3.1.2. Probability of crime
4.1.3.1.2.1. Overall <i>magnitude of probability</i> [U]

4.1.3.1.2.2. <i>Magnitude depends on</i>	
4.1.3.1.2.2.1. Design of product/complex – influences on probability of crime	
4.1.3.1.2.2.1.1. Basic design of stand	
4.1.3.1.2.2.1.1.1. When used as designer intended – does it cater for more than one bike?	
...1.1.1.	Do bikes (of common design) get in the way of each other when parked; when being parked/unparked? Can this lead to damage of other bike/s and/or significant blockage time?
4.1.3.1.2.2.1.1.2. When used not as designer intended	
...1.2.1.	Is it possible for more than one bike to be parked on stand? And/or is it possible for thoughtless user to lock other user's bike in, eg by threading lock arm/cable round own and other bike?
4.1.3.1.2.2.2. Contextual influences on probability of crime	
4.1.3.1.2.2.2.1. Target – in case of assault, target could be other user, or their bike – with former, see crime promoter for active aspects of behaviour	
4.1.3.1.2.2.2.2. Environment – instrumental	
4.1.3.1.2.2.2.2.1. Surveillability in immediate environment	
...2.1.1.	Actual or potential oversight by other users, passers-by or guards as preventers may cause conflicting parties to moderate their aggressive behaviour
4.1.3.1.2.2.2.2.2. Defensibility	
...2.2.1.	Can complex + environment shield victim from assault? Or corner victim?
4.1.3.1.2.2.2.3. Environment – motivating	
4.1.3.1.2.2.2.3.1. Could poor lighting cause people and or their bikes to collide in dark?	
4.1.3.1.2.2.2.3.2.	Does the environment (and/or the complex) force users into close physical proximity (eg when pushing past one another to leave the site), which could be provocative?
4.1.3.1.2.2.2.4. Offender presence	

4.1.3.1.2.2.2.4.1.	Is this an area where habitually aggressive people, or those who are drunk, may use bike stands? Beware of sweeping generalisations!
4.1.3.1.2.2.2.5.	Offender perception
4.1.3.1.2.2.2.6.	Offender resources – brought
4.1.3.1.2.2.2.6.1.	Is this an area where habitually knife-carrying people may use bike stands?
4.1.3.1.2.2.2.7.	Offender resources – locally found
4.1.3.1.2.2.2.7.1.	Availability of bottles, bricks etc in vicinity for adventitious weapons
4.1.3.1.2.2.2.8.	Promoter presence/perception/action or inaction
4.1.3.1.2.2.2.8.1.	Pressure – generating motivation for conflict by bad parking behaviour
4.1.3.1.2.2.2.8.2.	Provocation – aggressive behaviour as argument unfolds
4.1.3.1.2.2.2.8.3.	Inadequate site maintenance, leaving bottles, bricks etc lying around
4.1.3.1.2.2.2.9.	Preventer presence/perception/action – user
4.1.3.1.2.2.2.10.	Preventer resources – user
4.1.3.1.2.2.2.10.1.	Attack alarm? Audibility may depend on background noise level and if anyone present to hear and act
4.1.3.1.2.2.2.10.2.	‘Cool it’ skills
4.1.3.1.2.2.2.11.	Preventer presence/perception/action – passer-by
4.1.3.1.2.2.2.12.	Preventer resources – passer-by
4.1.3.1.2.2.2.13.	Preventer presence/perception/action – guard/manager
4.1.3.1.2.2.2.14.	Preventer resources – guard/manager
4.1.3.1.2.2.2.14.1.	Alarm to distract conflicting parties, summon assistance
4.1.3.1.2.2.2.14.2.	‘Cool it’ skills
4.1.3.1.3. Harm from crime	
4.1.3.1.3.1. Immediate harms mediated by Design of product	
4.1.3.1.3.1.1. Possible injury from being shoved against complex?	

4.1.3.1.3.1.1.1. Criminal event: harm to complex itself – product susceptible to:
4.1.3.1.3.1.1.1.1. Damage from being bumped into or being deliberately attacked as part of the conflict
4.1.3.1.3.1.1.2. Post-event: harm from design of product
4.1.3.1.3.1.1.2.1. As per damage to bike and/or stand
4.1.3.1.3.2. Wider harms
4.1.3.1.3.2.1. Unpleasantness, trauma, injury
4.1.3.1.3.2.2. Unwillingness of user to return to use stand on this site
4.1.3.1.3.2.3. User deterred from cycling
4.1.3.1.3.3. Contextual influences on wider harm
4.1.3.1.3.3.1. Things to bump into, to fall onto
4.1.3.1.3.4. Overall severity of harms [H] ?relative to all possible bike-related crimes, or to all crimes in general?
4.1.3.2. Conflict with other user/s over parking – competition for scarce spaces [incomplete]
4.1.3.2.1. Details of how crime unfolds
4.1.3.2.1.1. Conflict between users due to demand for spaces exceeding supply
4.1.3.3. Conflict with guard/manager over parking – infringement of regulations etc [incomplete]
4.1.3.3.1. Details of how crime unfolds
4.1.3.3.1.1. Conflict between users due to guard/manager seeking to enforce regulations – perhaps leading to insult, threat, assault, damage
4.1.3.4. Conflict with pedestrian – blockage
4.1.3.4.1. Details of how crime unfolds

4.1.3.4.1.1. Parked bike left in way of pedestrians – argument ensues
4.1.3.5. Conflict with pedestrian – Collision/cut-up
4.1.3.5.1. Details of how crime unfolds
4.1.3.5.1.1. Cyclist collides with/cuts up pedestrian whilst approaching stand – argument ensues