

## Grippa Working Paper

# Program Theory

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The Grippa research programme, mainly funded by AHRC, is a collaboration between the Design Against Crime Research Centre, Central Saint Martins College of Art & Design, University of the Arts London, and the UCL Jill Dando Institute of Security and Crime Science. Papers and other materials from the programme are at [www.grippaclip.com](http://www.grippaclip.com) and wider practical and research material on preventing bag theft at [www.inthebag.org.uk](http://www.inthebag.org.uk)

# Program Theory

## Introduction

Many kinds of object, system, communication, service or place are the fruits of deliberate professional design. Increasingly, design against crime is part of that process. The central interest in this paper/chapter/report is on the *security function* of those products, and how to describe both the *rationale* that underlies the activity of designing against crime, and the *immediate output* of that process, in the shape of the working prototypes and production models of design. Moreover, the attempt to do so goes beyond this immediate aim. Through a systematic and rigorous coverage of the field, followed by the intimate account of a case study applying the descriptive framework developed, it aspires to advance the process of bringing together the research and practice of design and crime science into a new interdisciplinary field.

## Background

The present exercise has several origins. One was occasioned by a marginal involvement in Project MARC. this was an attempt to develop a procedure to 'crime-proof' designs of domestic electronic products against crime (Armitage and Pease 200x; Armitage PD2 ch), building on an original paper by Clarke and Newman (ref). The ultimate aim was to develop a system which specified the *level of security* to be incorporated within the design of a given product, to be proportionate to the *risk of crime* to which it was exposed in its working life. Armitage and Pease noted limitations in the language through which the security of products could be expressed. Ekblom and Sidebottom (2007), in a paper entitled 'What do you mean, is it secure?', built on this in their turn to develop and define a complete glossary of security terms designed to provide clear and consistent tools for thinking and communication.

Although Project MARC involved security and industry experts handling real products such as digital cameras it was essentially a 'desk' exercise. Past and contemporary work within the Design Against Crime Research Centre has drawn designers (from CSM) and crime scientists (CSM, UCL-JDI) together into the process of designing real products [ref to article/chapter on that experience]. Earlier DAC efforts such as the *Karrysafe* bag and related products aimed at countering theft from the person

(ref), and the *Stop Thief Chair* (ref) exploring the scope for modifying classic chair designs so they could protect against bag theft, fed useful retrospective experience into this developing domain. Two projects were of particular relevance to the issue of security function.

- *Bikeoff* (ref) was about designing bike parking stands and wider facilities to be secure against the theft of bikes, for example by altering the shape of the stands so users were forced to lock or chain their bike by both wheels and the frame, a configuration shown by research to be more secure [(see ref/ XXX in this volume)].
- *Grippa* covered the prevention of the theft of customers' bags in bars through the design of special anchoring clips to fit on the tables. This project evolved through tests in individual bars to a major attempt to take the clips to production level and formally evaluate their impact on crime in a group of such bars.

Both seemed on the face of it to involve elementary, low-tech interventions acting in obvious ways; all, however, proved more complex and indeed required 'high-performance design' to turn them into practical and potentially effective propositions. The nature of the design requirement will become apparent, when we consider the *Grippa*, in particular, as a case study in the nature of design against crime. But suffice it for now to say that defining the security function of these products became a significant aspect of the task of design, and an even more significant part of capturing what was often tacit practice knowledge, rendering it explicit and capable of transfer to other designers. The task of combining the concepts and practice of crime science and design was challenging (ref bikeoff wpa2 report), and is still a work in progress.

Capturing, articulating and refining such knowledge plays an important role in *building innovative capacity* among designers (ref), so they are then empowered to undertake effective design against crime themselves. Building innovative capacity for designing against crime is a strategic necessity, for two reasons. First, crime prevention has to be customised to context to succeed (Ekblom 2002, 2005), meaning that the design effort does not just have to be made once (for example, designing a 'universal alley-gate') but adjusted or re-created many times over. Second, we live in a Heraclitean world of flux where

new technology, social change and offenders who are adaptive and innovative themselves render our store of 'what works' knowledge a wasting asset (Ekblom 1997, 1999, 2005). *Developing such innovative capacity* and then transferring it to designers is part of the core mission of the Design Against Crime Research Centre.

One channel for capacity building is *education*. My experience of working with design students began with acting as a judge in various crime oriented briefs for the Student Design Awards (now Design Directions) of the UK Royal Society of Arts. Here, the challenge was to enter a room filled with some 80-odd sets of posters and models illustrating the students' design submissions, and attempt in each case to rapidly grasp exactly what crime problem was being tackled, by what technique of prevention and how it was supposed to work. In other words, to discern the *rationale* of the design. Despite increased efforts in successive years to emphasise the requirement for a clear rationale, both in the guidance to students and in sessions briefing their tutors, there was little response.

Subsequent experience teaching on studio projects in undergraduate and master's courses (where students working as individuals or small teams have to come up with designs, say, against shoplifting or bike theft) has revealed a similar picture. During these projects the students present their work to tutors, practitioners (such as police design advisors, or retail security staff) and each other in 'crit' sessions, where they receive feedback and guidance before the final presentation and assessment. In many cases the rationale is poorly-communicated and poorly thought-through. In the real world this would transpose into several problems. It would cause difficulty in communicating with customers or design decision-makers (those who commission and/or choose to manufacture and market the design). This has important consequences, because what is communicated is not simply for a 'buy-sell' transaction where the customer takes or leaves what is on offer. A significant part of the design process is to help clients to become clear about exactly what they want of the designers – perhaps even to clarify and revise the nature of the problem (they had thought they wanted) to tackle. Even more fundamentally than this, the lack of a clear rationale would confuse the thinking of the designers which arguably could constrain the quality of their products.

The student experience raises a serious issue which is difficult to resolve. Generally a few students latch onto the concept of a clear crime-science-based rationale for their proposals, rise to the challenge from the earliest 'thinking

and creating' stages of design, and all participants benefit accordingly. A few others may think and create entirely intuitively but review and articulate their design rationale retrospectively. But with many others, this approach seems entirely *alien* to the way they do design thinking. I believe that it may be less of a problem with those training or trained in engineering design, but have so far had no direct experience of that.

### Aim and purpose of this paper

The aim of this [paper] is to set out a first-draft attempt to describe in depth the security function of a designed product or system. A product is taken here in its broadest sense of anything produced by design and manufacture, be it a portable object, place, communication or information. A system may be designed as a whole and within which one or more individual products may be designed to operate in an integrated manner, often also involving human agents.

The immediate purpose of the exercise is to report on the experience, in the Design Against Crime Research Centre, of designing various products with a security function, with particular focus (as a case study, in Part 2) on the Grippa clips designed to prevent theft of customers' bags in bars. In order to describe the experience, it is necessary to have, for reference, a generic framework that stands outside the particular design task in question. This is set out in Part 1. It should be noted however that this has not been a pure top-down sequence. Whilst many elements of the framework predated the Grippa project, they have since evolved, both as a result of the experience on that project and during the process of writing this document.

Wider purposes of that framework centre on developing and building the capacity of designers and others to undertake effective crime prevention design, to use the products of that design, and to foster the emergence of a truly interdisciplinary field of study and practice. In more detail they include:

- *Developing the innovative capacity of designers* (ref or fn), by evolving a way of structuring, focusing and communicating the design against crime task which nonetheless allows sufficient design freedom for creativity to be released. As will be seen, incorporating a security function within the design of a given product is a subtle, complex and challenging task that requires well-articulated principles; as indeed is designing and implementing a workable crime prevention project of any kind (Ekblom s-m...).

- *Building the innovative capacity of designers* (transferring existing knowledge, know-how and skill) by educating designers and design students in a particular way of thinking that draws among other things on crime science rather than pure intuition and 'common-sense' (mis)understandings and assumptions about crime. Also, by capturing and refining the design rationale for individual products and the wider knowledge of practice in ways which are truly generative, and which can be transferred to related design tasks, in ways that enable alternative choices to be made in different contexts.
- *Building the operational capacity of professional crime prevention practitioners* (such as police or local government officials) by helping them understand what a security function is and how it might fit within their crime prevention, security or community safety strategy. For example, how an alley-gate (ref ACC) can help reduce burglary, and how a particular design of alley-gate may be the most fit for the purpose. This will better enable them to commission a design task to address the crime problem they wish to prevent; or alternatively, to intelligently select from products off the shelf, the one fit for their particular purpose. Moreover, if users and designers are to collaborate on co-design, a common understanding and common language is vital, although the creative tension generated by differing perspectives must not be lost.
- *Bringing closer together the disciplines and practices of design and crime science*, by developing shared concepts and terminology covering research, theory, implementation and evaluation. In particular, it's a core requirement to bring together the approach to 'users and abusers' – so that it's possible to design products which are simultaneously *user-friendly and abuser unfriendly* (refs). Precedents exist for the merger of design and science, in architecture and engineering. It's fair to say these disciplines have not always produced buildings, bridges, cars, and mobile phones which are both functional, beautiful, durable and marketable; but at their best and under the right conditions of demand they can excel on all fronts. The team at the Design Against Crime Research Centre, in close collaboration with colleagues at the UCL Jill Dando Institute of Crime Science, are currently attempting to consolidate and articulate a generic process model of design against crime which both reflects awareness of crime science – which is perhaps best characterised as *applied, practitioner-oriented research and development* – and the broader practice-led research of design.

## Part 1 Framework and rationale for design against crime

Several steps are necessary to develop the overall framework. It's simplest to present these in reverse order, working backwards from the final requirement.

- The final step is the format for describing the security function of the product or system. The description uses four different discourses – *purpose* (what it's for and what other requirements it must meet), *niche* in the security world (what is the product or system protecting – itself and/or something/someone else?), *mechanism* (how it works in terms of cause and effect) and *technical realisation* (how it's constructed and how it operates in practice).
- In order to appreciate what the design is and is intended to do, it's first necessary to have a systematic and insightful way to *clarify the nature of the crime problem addressed*, and understand *the causes of the problem*, in a way that looks ahead, in generic terms, towards a solution. The way that problem, causes and anticipated solutions relate to the four levels of the security function amounts to a rationale connecting problem and solution. Although complete in itself, this rationale in effect skips the 'black box' that is the creative process of design. Neither frameworks nor rationale can do the design thinking for designers, of course. But they do define and structure the 'design space', and supply tools for thinking and communicating in the course of the design work and its many iterations, and after it is complete. They give plenty of leads into, and out of, that black box which can connect with wider models of the design process, for example that being developed within the Design Against Crime Research Centre itself.
- The initial step, immediately below, involves building some conceptual foundations by defining what exactly we mean by the security function of a product or system. This will be a definition-in-depth, which links together underlying concepts including function, risk, crime, causation, crime prevention, community safety and security. [here or later?]The intention here is to build on the security glossary developed in the paper 'What do you mean, is it secure?' (Ekblom and Sidebottom 2007) and subsequent updates (listed on [www.crfr.org](http://www.crfr.org)).

### What do we mean by the 'security function' of a product?

'Security function' is taken to mean:

*The properties of a product which, interacting through causal mechanisms with entities, agents and systems*

*within its environment, serve the purpose of reducing the risk of crime and increasing security and community safety. The properties in question may be deliberately conferred, amplified or directed through the design, materials and construction of the product and/or its environment.*

Much is squeezed into this definition, and some of the terminology needs further clarification. We can unpack its elements in turn, in a consistent and comprehensive 'definition in depth'.

## Design

Design implies a purposive, reflective, sustained, structured, focused and iterative process of creating, testing and improving some product, usually taking into consideration 'multiple drivers' (such as security plus safety, sustainability and inclusivity) and functions (such as a car primarily serving transportation but secondarily security against theft, vandalism or misuse for crime). The *deliberate* nature of design contrasts with security *incidentally* conferred for example by the weight or bulk of a product. However, design may *capitalise* on that property (e.g. by adding a high-friction base to a heavy TV set so it's even harder to drag away), hence the inclusion in the definition of 'amplified or directed'.

## Function and purpose

Performing some *function* is about *working for a purpose*. 'Working' refers to actions and their underlying *causal mechanisms*, described below. 'Purpose' is obvious and inherent in the design task – in this case it refers to crime prevention, security or community safety, and a range of other 'drivers' or requirements which may be of greater or lesser priority than crime. At this point we are considering the purpose as intended by the designer, on behalf of the client and/or the legitimate user; other perspectives will however shortly emerge. Functionality could refer to the whole of a product (this lock prevents burglary); or alternatively, to some distinct feature (strengthening ribs are included in the cash box to resist forcible entry by thieves) or component (a tamper-evident lid is added to the container to prevent deliberate poisoning).

## Crime

Experience has shown that for the benefit of designers, it's both helpful and important to dig down, beyond the concept of crime prevention, to define crime itself – both in general and (further below) regarding particular types of crime such as theft. *Crime* in general can be defined as

conflict between individuals over ownership of property, integrity of person or acceptability of behaviour, that violates the law and thus places thus offender in conflict with the state and its institutions.

## Risk

Risk is about the uncertainty of future adverse events. It means the *possibility* of some class of criminal event (such as theft), *probability* of such an event occurring in a given time period and *harm* emanating from the event at the time or subsequently. As will be seen, the risk can be *to* the product or *from* it; the product can protect itself and other things or people *against* risk; and there may also be the risk of *failure* of the *security function* in these respects.

## Crime prevention

Crime prevention is simply enough, *reducing the risk of criminal events* by *intervening in their causes*. Alternatively, adopting a more agent-centred discourse (Eckblom richer etc), *reducing the risk of criminal events by disrupting offenders' plans and frustrating their goals*. As just defined, risk in turn decomposes into possibility, probability and harm. Traditionally prevention has focused on probability, but there is increasing interest in more explicitly incorporating harm reduction. Harm also features in security and community safety. Design against crime can direct its efforts towards eliminating possibilities, reducing probability or reducing and mitigating harm.

## Security

Security can be defined as *deliberate action to reduce the risk of criminal events, taken before, during or after the event*. The latter, temporal, dimension draws on the *Haddon matrix* (ref) described (in a counter-terrorism context), by Clarke and Newman (2006); it also takes in the post-event dimension of the Crime Lifecycle framework (ref). It can be further refined as follows, using design examples:

- *Primary security*
- Action eliminates *possibility* of criminal event (e.g. using system design to replace the annual payment of vehicle tax, which many drivers manage to evade, by increased fuel tax, which they cannot); or if this cannot be done,
- Action reduces its *probability* (e.g. making it harder to break into cars)

- *Secondary security* – if event does happen, action *limits harm to all parties and property as it unfolds* (e.g. stopping the ongoing damage and continued loss of revenue from a vandalised vending machine by rapidly alerting the repair team)
- *Tertiary security* – action *limits propagation of harm* that may occur post-event (e.g. by preventing further offences such as identity theft following the theft of a credit card)
- *Mitigation* attempts to repair the harm that has already been done (e.g. a backup system for the data lost with a stolen phone)
- Together, the capacity to deliver secondary and tertiary security and mitigation amounts to *resilience*

We should note that, although some of these domains involve taking action during or after the criminal event or events, all can be anticipated and prepared for, and design can play an important part in that preparation. From both crime prevention and security perspectives, harm is both a consideration in setting *priorities* within the design process, and something for designers to aim to *avoid, reduce or mitigate*. Therefore, analysis of potential harm is of vital importance to the design against crime process.

### Community safety

Community safety (refs) is a far broader concept than crime prevention: an aspect of *quality of life* centring on *risk reduction and harm mitigation* but emphasising the *positive benefits* these can bring. It covers:

- Freedom from and/ or reassurance about a range of real and perceived risks relating to *crime, antisocial behaviour, drug abuse & terrorism*
- *Ability to cope* with the consequences of those incidents they nevertheless experience
- *Help to cope* if unable to do so alone
- *Confidence* in the police, CJS & other agencies to stop or remedy problem
- *Trust* – within and across cultural/ ethnic boundaries
- Being in this state to a sufficient degree enables individuals, families, communities to:
- Pursue *necessities* of cultural, social & economic life
- Receive adequate services
- Exercise *skills*
- Enjoy *well-being*
- Engage in *community life* and develop/maintain *social cohesion*
- Create *wealth* in the widest sense

Design in support of this state of safety, and of its benefits, is obviously far wider in scope than design against risks of specific classes of criminal event. It will embrace, for example, ‘emotional design’ (Norman ref), design for happiness (Layard ref), individual and collective efficacy and empowerment (ref?). On the other hand, secure design that is over-fortified, anxiety-engendering and inconvenient obviously fails these wider requirements whether or not it objectively reduces the risk of criminal events.

### Causal mechanisms and properties

Causal mechanisms refer both to how criminal events are caused, and *how the product works*, to lead to desired outcomes; in this case how the design of the product, interacting with environment, users, abusers and others, successfully helps to prevent the crime. Basic examples from Situational Crime Prevention (ref) include increasing the effort or risk for the offender, and reducing the reward or provocation. Causation invariably involves *exchanges* of energy, matter or information, so mechanisms are *interactional*; in practice this means that they always have to be understood in terms of particular context (Pawson and Tilley 1997, Ekblom 2005, 2008). Without certain necessary contextual conditions, a mechanism causing successful crime prevention cannot be triggered – just as a match will not light a fire in the absence of fuel, and the presence of rain or wind. Causal mechanisms and the purpose they support go together to comprise function. Put another way, a function could be termed a *mechanism with purpose*.

The characteristics of the product which contribute to making these mechanisms possible are its *causal properties*<sup>1</sup>. These include physical or informational fundamentals, such as mass, hardness, reflectivity, rigidity or flexibility and appearance, which individually or in combination ‘carry’ causation, such as susceptibility or resistance to breaking. They may also include more subtle properties such as those which enable them to discriminate between user and abuser, preventer and offender, which may be mediated by mechanical means (such as a conventional lock and key) or informational ones (such as a password facility).

Properties in the sense just described largely come under a technical discourse. But they can also be described in *functional* terms from the perspective of some user or offender. By this, I mean the ways in which the product can be used or misused, treated appropriately or mistreated in line with some purpose – *concealability, visibility* and so on. Functional properties will generally derive



from combinations of physical properties. For example, concealability may come from size, shape, smoothness and even rigidity, determining how easily some product may be slipped unnoticed into the pocket of someone stealing it or indeed by someone hiding it from thieves.

The properties are conferred by the *materials and construction* of the product. For example, a secure container may have edges reinforced by hardened steel; or bolts may have distinguishable *features* of construction and appearance, such as sloping heads to prevent tools from getting a grip. The properties may emerge from the relationship between the product and its environment – to take a simple and literal example, the ability to anchor a laptop comes from the laptop having a designed-in anchor point (structural) firmly embedded in the resistant frame (material/structural), connected via a tough cable (material/structural) to an anchor point in the environment such as the leg of a heavy table (material/structural). The product may have properties that are dynamic – the safe that sprays its contents with dye when breached – and even ‘smart’ ones – the computer that makes a judgement and reports itself stolen via the internet.

### Entities, agents and systems

Entities are ‘things’, ranging from portable items which could be *targets* of crime or *tools/weapons* for crime, to the physical *environment* and any *enclosures* such as fenced compounds, buildings, rooms or even safes.

Of course, the product will not just interact with that environment, but with people present in it (or otherwise able to influence it remotely) acting as *users*, and perhaps as *offenders*, *crime preventers* and *crime promoters*. It’s helpful to view people from twin perspectives – as *caused agents*. Their motivation, emotion and performance may be caused (provoked by an officious notice to vandalise it, stressed by overcrowding on the train, and spilling beer in a bar due to distraction by heat and noise). Alternatively people may themselves cause things to happen – in most cases intentionally, involving goals, plans and decisions. Mechanisms working through people can be described in both ways – causally and intentionally. The latter ties in with the requirement, mentioned above, to consider purpose and function from the often divergent perspectives of offender and preventer. From the design perspective the latter role will normally be equivalent to the user, although users can steal or damage things too in the wrong circumstances.

Together, the entities and the human agents taking on

these roles make up the immediate circumstances of criminal events. They can be described in terms of the *Conjunction of Criminal Opportunity* (CCO) (ref). This integrates a range of situational and offender-oriented theories of crime in a single framework. CCO serves as both a map of the causes of crime (more strictly put, of the interacting ingredients of the immediate causal mechanisms of criminal events), and overlaid on this, a map of preventive principles for intervening in those causes. CCO is further described below.

How the product works to confer security may best be understood when viewing it as part of a wider system – the secure operation of a bike stand, for example, can only be considered as an interaction between bike, stand, user and environment (such as the ground in which it is anchored).

This completes the setting out of basic concepts of security. Some will be revisited below as the overall framework unfolds.

### The designer’s task – from problem clarified and understood to solution anticipated

To greatly oversimplify a much fuller process designers, often in collaboration with clients or users, have to undertake several key tasks. This section does not attempt to describe the design process in full – how the designer does the design work – that is attempted elsewhere (ref Gamman & Thorpe; Inns book chapter D21c). Rather, it tries to capture, and refine, the rationale or thread of design against crime thinking, that runs through the design process.

[incorporate more of G&T process/terminology – which version?] Designers must define *what exactly the problem is* that needs to be tackled; research and understand the *causes, consequences, interests of the various stakeholders and dutyholders*; and clarify, in generic terms, what *kind of solution* they want to aim for. Then they have to go ahead and develop a *real, practical, solution* that satisfies these requirements and correlates with the specification developed; and can be ‘scaled’ – delivered to the production and marketing processes. This is a process that requires them to view the problem from all angles, generate creative ideas, iteratively test, filter and improve them, trying them out on paper, in computer, in workshops or in the field. This section focuses on the pre-creative tasks of clarifying problems, understanding causes and anticipating solutions to aim for. The main purpose is to pose the question to which the proposed or produced design is the answer: *the description of the design (in the*

next section) can only be fully understood in relation to the problem and causes it seeks to address.

### Frameworks required – moving between detail and abstraction

Crimes are many and varied. Like any other practitioner tackling crime, designers usually have to address the specifics of the problem – not just crime, but theft; theft of bags; theft of bags in bars; from the feet of seated customers. The reason for this is that the detailed configurations of causes will differ from problem to problem and context to context; and as pointed out, preventive mechanisms are often highly context-dependent. A sufficient understanding on which to generate plausible design solutions additionally means acquiring a deep appreciation of *normal* use and the requirements of immediate users and other stakeholders/dutyholders such as site managers. Normal use, after all, may well be the primary purpose of the designed product, which security requirements interfere with at peril of rendering the product unsaleable and unusable.

But it is easy to become lost in the detailed specifics of abuse and normal use. Designers also need to be able to consider the problem in more *detached and abstract terms*, both to help the current creative process and to be able to connect with past solutions to other problems whose elements may transfer to the case in hand. Designers attempting to create entirely new products further need to *anticipate* the range of possible crime risks to which those products might be subjected. Various frameworks are available which can help designers move between the generic and the specific, between contemplation of past, present and future, and between research and thinking (and later, making). We begin with frameworks which help clarify and define the nature of the crime problem, then those which give leads for understanding it. In an applied world like design, understanding has to ‘have a destination’. So for each framework introduced, the description concludes with a high-level statement of what it is that designers need to do, in the terms of that framework, to produce successful preventive designs.

The frameworks serve not only to describe and justify designs and design decisions in a dry and documentary way, but also can be drawn on by designers in their live thinking, reflecting and communicating processes in the course of the design task. Although the frameworks are presented in a fairly logical, compartmentalised and linear sequence, the process in real life is of course likely to be very messy and iterative.

### Defining the crime problem

We cover several aspects of problem definition. First comes a way of handling, in a broad-brush way, the range of possibilities of crimes that designs may face; second, a way of moving beyond a mere listing to an appreciation of the defining characteristics of these various possibilities; third, an indication of the importance of crime- and context-specific detail; and finally a warning about taking demand as described by stakeholders and clients too literally.

#### Considering the range of possibilities for crime

To aid detachment and anticipation designers must consider the entire range of generic crime possibilities as they implicate or involve their intended products. A manageable way of doing this is the *Misdeeds & Security* framework (refs). Just about every designed product may be at risk of being:

- Misappropriated – property stolen, information stolen or made unavailable
- Mistreated – property damaged, information integrity compromised
- Misused – as tools/ weapons for crime to support a specific Modus Operandi, or to be consumed as illegal drugs; this heading includes countermeasures against police or forensic tactics, and in particular those which Mislead attempts to identify people or property
- Mishandled – property subject to deception, counterfeiting and smuggling; confidentiality of information breached
- Misbehaved with – creating an environment conducive to disorder

Each of these possibilities comes with associated probabilities and harms, which designers need to research and understand before they can decide which to address and how to go about it. In many cases the product may be at risk of several such misdeeds simultaneously. And they string together – for example a shotgun could be misappropriated and mistreated (sawn-off) in order then to be misused in a bank raid.

#### Defining the generic crime problem

It is also helpful to understand the key defining characteristics of each of these generic types of crime problem or risk. For example, Misappropriation or theft can be defined as:



- The *illegitimate permanent possession and use* of the target product, information, services etc
- The *criminal intent* of the offender – ie the act is goal-driven, not inadvertent
- The *illegal transfer event or process* that brings illegitimate possession about; which may lead to a further transfer in sale of stolen goods
- The *stealthy* nature of the transfer (unlike robbery or deception) – ie it is intended to be accomplished without the awareness of the legitimate possessor or other parties capable of acting as preventers, that a theft is taking place, at least until the offender is in a position to escape and/or cover tracks

### Going specific – crime analysis and ‘thinking thief’

The designer then needs to move back towards the specific and the particular. The approach to this that has evolved in the field of crime science is *crime analysis* (e.g. Clarke and Eck 2003, Zahm cited equiv), which uses data from existing crimes to pose questions centring on ‘what kinds of crime were committed, against what human or material targets, at what times and places, by what offenders, using what perpetrator techniques?’ This of course only works for problems which have patterns already established, which may be a significant limitation when designing new products. In these cases, to fill the ‘inductive gap’ it is necessary to resort to generic theory-based approaches to ‘thinking thief’ (Ekblom 1997, Clarke and Newman 2006), which have some similarities to user-centred design (ref). But few products are entirely new, allowing for some generalisation from common patterns.

### Caution over face-value demand

We should note at this point that defining the problem is not always as straightforward as the above discussion implies. Crime prevention practitioners are familiar with the difference between ‘demand’ as expressed by stakeholders, and the nature of the crime problem as finally revealed in the light of more systematic crime pattern analysis, surveys and so on. What starts by being called a ‘crime or antisocial behaviour problem’ may in fact be part of a *civil conflict* over use of space – for example young versus old users of a shopping centre. Designers, too, may see part of their role as helping the client not just to clarify the problem but to think of it in a fundamentally different way. (‘I can improve this washing machine, as you ask; but I can also design a better one, or design a new approach to washing; I can even help you think through why you want to wash clothes in the first place,

and whether there is some more beneficial alternative.’) This chapter/paper/report assumes however that crime does remain a central issue to be addressed. However, recasting crimes as ‘civil conflicts of interest that have gone wrong’ may sometimes be fruitful with ‘expressive’ crimes in particular.

### Diagnosing the crime problem

Having discovered, identified and clarified the crime problem, but before diving straight into generating possible solutions, the designer has to arrive at an *understanding* of the factors contributing to the problem. Several approaches can contribute to this diagnosis. The simplest is that of risk factors.

### Risk factors

The risk factor approach is based on a mix of situational crime prevention theory and statistical analysis of common types of crime targets. It can be used to anticipate crime problems in new designs or to look for weaknesses in existing ones. Again this has been developed primarily with Misappropriation, in the form of the CRAVED formula for identifying ‘hot products’ (Clarke 1999). If products are Concealable, Removable, Available, Valuable, Enjoyable and Disposable they are very likely to be at high risk of theft. Equivalent formulae have been produced, for example, for mobile phones at risk of theft (IN SAFE HANDS) (ref) and physical targets of terrorist attack (EVIL DONE) (Clarke and Newman 2006; Boba 2009).

Risk factors offer an excellent *heuristic* for quickly and simply communicating ideas to designers and helping them make initial speedy progress. But they should not be seen as the last word of subtlety. Ekblom and Sidebottom (2007) point out that concealability, for example, may benefit different agents depending on the stage of the unfolding criminal event: a concealable phone can be protected from theft by the owner as well as hidden by the offender from pursuers and surveillance cameras after it has been stolen. And one forecast ‘hot product’ at least did not, in the end, become a special target for theft. The TV set-top box, enabling digital reception, looked set to become the next hot product, until many service providers decided to supply them free and to get their profits via subscription payment.

In the application of this understanding, the designer’s task is to use known risk factors to cautiously forecast which products need greater security, against which crimes in which contexts; and where possible to address

those risk factors directly by design – for example, making something less valuable or concealable – where other requirements allow.

#### Causal mechanisms – basics

An understanding of the immediate causal mechanisms of crime and of its prevention is arguably the royal road to analysing risk and reducing it through design, although the analytic and theory-based approach that it involves, may not appeal to all designers. We focus at this point on causation.

Classic situational theories, which suggest key causal mechanisms, are Rational Choice Theory (RCT: Cornish and Clarke ref) and Routine Activities Theory (RAT: Cohen and Felson 1979). The former takes the perspective of the 'rational offender' as an active agent making decisions, principally in the immediate circumstances of the crime (e.g. whether to steal this bike or that bag). On the agenda are risk (of harm to offenders themselves), effort and reward. The designer's task is to identify issues of risk, effort and reward and attempt to make them unfavourable for the offender.

Complementing this goal-oriented role is the picture of the 'caused agent' supplied by Wortey's (ref) 'crime precipitation' model, which sees situations as having the potential to influence perception, motivation and emotion through prompting, pressuring, provoking and permitting criminal action. [examples?] The designer's task is to understand and manipulate precipitators influencing the offender's perception, emotion and motivation. RAT covers an ecological conjunction, identifying necessary preconditions of criminal events as 'likely offender, suitable target and absence of capable guardians'. The designer's task is to understand how these preconditions come together, and identify ways of blocking their conjunction, or if impossible, to anticipate and respond to the increased risk of crime. Pattern theory (Brantingham's ECCA book) identifies fundamental geographical relationships (movements between nodes via paths, boundary processes) which relate to crime and bring the other causes together for example in 'crime generators' (places where there is a high crime rate simply because of the volume of potential offenders and targets/victims encountering each other) and 'crime attractors' (places uniquely favourable for crime, which therefore draw offenders to them). The designer's task is to understand these patterns of geographical coincidence or deliberate planning, and identify ways of blocking their conjunction, or if impossible, to anticipate and respond to the increased

risk of crime.

A popular framework for conveying quick and simple understanding of some of these theories of immediate causation of criminal events is the Crime Triangle (ref). This covers Offender, Target or Victim, and Place, and should be responded to in the same way as RAT. A more inclusive equivalent, developed by integrating concepts from the above situational theories and others on the offender side, is the Conjunction of Criminal Opportunity (CCO). We briefly encountered this above, but here is the full list of immediate causal elements and conditions that enable crimes to happen.

According to CCO, a criminal event occurs when, for example,

- *A predisposed and ready offender*
  - Perceiving an acceptable risk of *harm, effort/cost/time, reward*
  - Properly-resourced with *time, tools and perpetrator technique,*
  - Ready to offend by virtue of *motivation and emotion...*
- Encounters a valuable and insecure *target* (e.g. a bag)
  - In the *absence* of people who can act as ready, willing and able *preventers* (e.g. careful bag owner or some other guardian)
  - In the *presence* of people who can act as *crime promoters* (eg careless owner, indifferent bar staff)
  - In an *environment* whose properties favour offender over user/preventer
  - That perhaps features an *enclosure* e.g. a public bar

Various other causes are represented in the more formal statement of the framework (ref) and in Table 1 below. Arguably, CCO gives the designer a broader and deeper understanding of the causes of crime that they have to address, and a better basis for generating preventive ideas than the individual theories of situational prevention. This is partly due to its more integrated approach, to the richer detail of causal factors covered (which is conducive to considering a fuller causal context), and the ability to view causation from a range of different perspectives including those of preventers and promoters (in contrast to situational prevention which focuses either on the offender's view of opportunity or the target's utility to the offender (as in CRAVED).

The designer's task is to understand, then arrange to block, weaken or divert one or more of these causes so the Conjunction doesn't come together and the necessary preconditions for the criminal event to occur are not met. This is a simpler and more inclusive task statement than those engendered, above, by the individual situational theories, but the individual causal elements can be homed in on as appropriate.

### Products and causes

Earlier definitional work on product security (Ekblom and Sidebottom 2007) distinguished various causal roles that products could take relative to the risk of crime. These roles may help in diagnosing existing crime problems and anticipating new ones.

*Criminogenic* products are those whose properties give rise to a certain possibility and probability of crime. *Criminally harmful* products, obviously enough, increase the harm from crime. *Criminally susceptible* products are capable of being harmed by crime.

The properties elevate the risk in many ways. The most fundamental distinction is between products that are the *target* of crime, and those that *contribute* to crime against other people and things, whether misused as resources (tools and weapons), or misbehaved with in public disorder. *Functionally* criminogenic properties are those which increase risk by being of some utility to the offender (as in *concealability*).

Turning to prevention, *criminocclusive* products reduce the possibility and probability of crime; *criminally mitigating* products undo some of the harm – for example, if they serve to back up a computer or a phone.

Finally, *security-inhibited* products are those where the basic security properties would be adequate but other properties interfere with them, perhaps by countering the intervention mechanism (eg the lock is made unreliable through wear), by weaknesses of implementation (eg inadequate mounting) or by inadequate involvement – eg factors which inhibit the intended user from deploying them properly or at all – user-unfriendliness, uncoolness etc.

### Strategic and tactical contradictions

Where this process is to be met by modifying the design of the target of crime, the challenge, from a design perspective, is that the properties of that product which

make it valuable to the offender, and vulnerable to theft, for example, are pretty much identical to the properties that make it valuable and usable to the owner/user. The designer's primary task in preventing theft of the product is therefore to discriminate between the legitimate and illegitimate possessor in both the possession and the stealthy act of transfer, without interfering with the rest of the design requirements that serve users and other stakeholders. This is analogous to the equally-challenging task of designing a drug which will destroy a tumour without destroying healthy tissue, which may be 99.9% similar. Where the designer chooses, or is required, to modify other elements of the conjunction than the target (such as the enclosure or the environment), similar contradictions apply. Likewise, other offence types have equivalent challenges. For example, designing the interior of a bar that is conducive to the majority having a good time but not to alcohol-boostered violence from a minority.

Strategic contradictions such as these might seem a towering obstacle to design against crime. But the generic approach to 'inventive principles' known as TRIZ (ref) suggests that the more sharply-expressed the contradictions in a design requirement, the clearer the designer's task in seeking to resolve them. The fundamental theft prevention requirement of discrimination between user and abuser is one such contradiction.

Designers also have to address what could be considered more tactical contradictions. The 'troublesome tradeoffs' (Ekblom 2005, 2008) between crime prevention and other requirements (such as convenience and safety), are one such class of contradiction. Note that there may also be tradeoffs *within* crime prevention (such as between exclusion of offenders by barrier, and surveillance blocked by barrier – unless it is see-through). And there may be tradeoffs too between reducing probability of event and reducing certain kinds of harm: a strong door lock may keep burglars out (probability), but if they do smash it they are likely to cause more damage (harm). But the fundamental contradiction apart, conflict and competition may not be the whole story. Some functions may complement one another (such as tidiness and security) or even synergise.

To restate the above task in these more generic terms, the designer's major task in preventing crime is to understand, clarify and then resolve the contradictions in the design requirement, whether these are strategic ones relating to fundamentals of the crime problem, or tactical ones, which may relate to troublesome tradeoffs with other drivers/values, or within crime prevention itself. Contradictions apart, the designer must also seek

to exploit complementary or synergistic functions (ref sustainability?).

### Causal mechanisms – dynamics and complexity

Where diverse sets of people, pursuing their own, sometimes conflicting and contradictory interests, perceive, anticipate and adjust their behaviour to one another against a backdrop of entities including targets, material resources, enclosures and environments, we have all the ingredients of a *Complex Adaptive System*. The static listing of necessary causes, above, isn't subtle enough to capture the full complexity of what is going on. Within situational crime prevention limited aspects of the dynamism are already captured by understanding of the process of offender decision-making, some by the concept of displacement (where offenders frustrated by one blockage shift their timing, location, choice of target or choice of technique), which has been shown to be more limited than was feared (ref Hesseling 1993). But the dynamics unfold over different timescales, both immediate and evolutionary (e.g. where offenders develop new techniques perhaps exploiting social and technological change – see Ekblom 1997, 1999, 2005). Designers and designs therefore run the risk of their success in preventing crime being only ephemeral in nature, so further frameworks are needed to help research, understand and influence these dynamics. One such framework already exists within situational prevention – namely *scripts*. Another evolved from this in the course of the design work on bike parking and bag theft – *script clashes*. Still more relate to the consideration of the causation and prevention of crime from a holistic system point of view, and to the roles of human agents within crime prevention, and how to understand and influence them. For presentational purposes these will mostly be discussed under the following section on solutions.

### Scripts and script clashes

The analysis of crime scripts (Cornish 1994, Ekblom and Sidebottom 2007, Ekblom 2008), and script clashes between preventers and offenders (e.g. conceal versus detect, pursue versus escape) is important here as a means of understanding the *dynamics* of criminal events prior to intervening in them by design. It is also important in describing the security function of a product.

On the agent side, the dynamics of criminal events can be approached through the concept of scripts (refs). In situations which people repeatedly encounter – eg parking a bike or having a drink in a bar – they learn which actions

work best. The result of this learning is a cognitive script – a structured sequence of things to attend to, and things to do/avoid, in achieving some purpose or goal. Scripts may be flexible and branching (plan A, plan B). They may be associated with particular civil or crime-related roles.

#### A user/preventer script:

- Find pub, enter pub, find seat/table, deposit bag, order drink, return to table, enjoy drink, pick up bag, leave.

#### An abuser/offender script:

- Find pub, enter pub, find bag + owner, take bag, leave, dispose of bag, sell/use contents.

Scripts are instrumental *competences*, used to generate *performances* in particular times and places – with improvisation & exploitation of materials to hand. Offender scripts, when combined with skills and resources, amount to *perpetrator techniques* or *modus operandi*. Performance usually results in an event:

- E.g. a successful crime – which is the offender's goal to achieve, the user's/preventer's goal to avoid or disrupt
- Or a safe and successful drinking episode, which is the user's goal to achieve, the offender's goal to disrupt

The designer's task from the 'human-as-agent' perspective, is to block/disrupt the offender's performance of their scripts without blocking/disrupting that of the preventer. From the 'human-as-caused' perspective, it is to remove or moderate the pressures, prompts and provocations from other people in the crime situation and/or in their common environment which may motivate or otherwise cause the offender to commit the crime.

The performances of two or more agents, following and improvising from their scripts, causing and being caused, may interact – generating *stories* which culminate in a crime completed, or a crime prevented and a legitimate user goal achieved. Understanding these stories is vital for designers to get to grips with the dynamics of real crime situations, fully meet the user-friendly/abuser-unfriendly contradiction and optimise on Troublesome Tradeoffs with other values/requirements. Each interaction involves dynamic interplay of actual and perceived risk of harm, effort/cost/time and reward, as opportunities open or close, are created or happen to come together. Of

particular interest here are conflicts – oppositional goals (eg owner wants to keep bag v thief wants to take bag) and clashing scripts in the service of those goals. The offender and preventer roles by definition have conflicting goals, causing tactical *script clashes*:

- Surveill v conceal
- Exclude v permit entry
- Wield force v resist it
- Conceal criminal intent v detect criminal intent
- Challenge suspect v give plausible response
- Surprise/ambush v warning
- Trap v elude
- Pursue v escape...

The designers' task is to arrange the situation by manipulating the design and configuration of entities in it

- To favour the user over the abuser in each of these tactical clashes in terms of the shifting dynamics of risk of harm, effort, reward – so story ends with the bad guy losing!
- Alternatively, to arrange the wider environment to avoid the clashes happening at all

#### Wider understanding of roles

Scripts and script clashes offer a micro-picture of interacting human agency before and during criminal events. But even professional offenders, fences and security guards don't spend their entire lives in crime-related roles – as offenders, promoters and preventers in CCO terms. What they do in other domains – their other, civil roles as, say, customers or staff in bars, cyclists, or managers responsible for parking facilities – is important for designers to know about. This is because occupying these other roles may well give people the opportunity or the motivation to cause or prevent crime by action or inaction, presence or absence. And these other roles, their interests and the ways they behave, may make certain design solutions possible, difficult or impossible to pursue. Designers must build on traditional [?] analysis of stakeholders and dutyholders, and user-centred design, to develop an understanding of all the players in immediate crime situations, in their civil as well as crime-related roles, and allow for their interests and capacities in their design. On the prevention side, they should ensure their designs work with the motives and capacities of individual people and organisations rather than undermine them. A framework for doing this – CLAIMED – is described in the following section on describing solutions.

#### Describing design solutions – from specification to realisation

Before, during and after the product development stage designers must be able to describe their proposed and/or realised solution. A statement of security function is a part of that description. Depending on the purpose of the product, the security function will be of greater or lesser centrality to the design as a whole, as will be seen.

Setting out the security function for a designed product should be done in a way which is as *universal* as possible, for several reasons:

- To maximise *design freedom* in designs and redesigns of products themselves. The ability to create should not be constrained by the ways available to talk about that act of creation. Supporting such 'design freedom' is important for two reasons. First, it gives the maximum scope and professional challenge to designers to maximise all the benefits and resolve the conflicts and tradeoffs within the task, and adapt to diverse contexts of use. Second, from a specifically crime prevention perspective, dealing with adaptive offenders and changing tools, weapons and 'facilitating conditions' (C & N outsmart) for crime requires that we maximise the variety and flexibility of possible solutions that stream out of design workshops and into deployment in the real world. This is the requirement to cope with the almost inevitable obsolescence of individual preventive solutions, and to out-innovate the offender (Ekblom 1997, 1999, 2005). It also imposes the requirement on the offender of anticipating and tooling up to deal with many different kinds of anticrime design: on any one attempt, they may not know the challenges they will have to deal with.
- To aid *reflective thinking and communication* during an ongoing design task, both within a design team and between designer, client and user (who may act as a co-designer).
- To act as a *reference frame for assessment* of the quality and performance of individual designs during the development process (e.g. at critique stages) and when the designs are deployed in the field.
- To *transfer the knowledge* from the experience gained within a given project to a wider set of design tasks and designers (i.e. to help build designers' innovative capacity in the crime field).
- To illustrate *the complexity and the challenge* of the design against crime task.



As said, the frameworks are not intended to do the creative job of the designer in connecting understanding and solution; rather, to structure the design space and articulate the design task.

The description will need to draw on aspects of both problem definition and specification of solution. Inevitably, too, the capacity to *describe* a security function closely connects with the capacity to *prescribe* it – statements of ‘what is planned, and what was done’ intimately relate to those of ‘what should be done, and how to do it’. They will use the same language and concepts.

Many of the frameworks already described as aids to understanding the nature and causes of crime problems, can therefore be pressed into service for describing, and prescribing, solutions. (This was indicated by the various ‘designer’s task’ statements in the previous section.) For example, the analysis of causes of crime offered by the Conjunction of Criminal Opportunity can be matched by a counterpart account of preventive interventions targeted on those same causes (e.g. ‘Valuable target? Make it less valuable to offender’).

Building on earlier discussion, there are four levels of a serviceable description of a product. Each has its own discourse.

- *Purpose* – what the designed product is for, including both security and other drivers or requirements.
- *Niche* – how the security function within a given product relates to other products, people and places in the human, informational and material ecosystem of agents and entities.
- *Mechanism* – how the product’s security function works in terms of cause and effect in material and human terms.
- *Technicality* – how the causal properties of the product are realised through materials, structure and features of the design (construction), how the design is produced (manufacture) and how the design operates in practice (operation).

*Contradictions* can occur within each domain. Strategic contradictions of purpose relate, for example, to the inherent conflict within the nature of crime previously noted (‘I own it – the thief wants it for very similar reasons’). A more tactical, technical contradiction could occur when, for example, a product needs to be simultaneously lightweight (for user-friendliness) but robust (for crime resistance). Being at the heart of the design task as already indicated, contradictions need to be well-articulated.

[here or later? Or repeat?] The various aspects of the description can be illustrated by the Stop Thief chair, whose picture graced the front of CPS20. I have deliberately not included this picture here, so you have to rely on the following text to understand its purpose, how it works and how it’s made. The more detailed description of the Grippa clip is saved for the case study in Part 2.

### Purpose

Describing purpose has to cover several distinct aspects. Taking the Stop Thief chair as illustration:

- What is the designed object for? To sit on comfortably. This is its *primary* purpose. But this is not the end of the story.
- What, if any, *secondary* purpose does it have? Helping to secure the bags of the user seated on it; alternatively, reducing the risk of removal, by the offender, of the bag from the vicinity of the seated owner. We could take this further by considering each aspect of risk separately: do we particularly wish to eliminate the possibility of theft, reduce the probability, or reduce the harm and/or mitigate that harm? We should also specify where the product is intended to be used, e.g. bars, cafes, libraries.
- What other *desirable* requirements must it meet, that are beneficial to the immediate users and manufacturers, or expressed alternatively, what other drivers must it satisfy? It must be attractive, economical to produce, safe, durable and stackable, suitable for a range of working environments.
- Finally, what ‘hygiene’ or *social responsibility* requirements must it meet (referring to other societal values which the product should not interfere with, or should positively boost)? It must be sustainable (low energy/material costs to produce and maintain, and durable) and inclusive (e.g. suitable for people of all ages and a range of sizes and abilities to sit on).

It’s helpful at appropriate moments to restate the ‘designer’s tasks’, which were the *destination* of understanding, but the *departure point* for generating solutions.

In generic terms, the designer’s major task in preventing crime is to resolve the identified contradictions in the design requirement, whether these are strategic ones relating to fundamentals of the crime problem, or tactical ones which may relate to troublesome tradeoffs with other drivers/values or within crime prevention itself. Contradictions apart, the designer must also seek to exploit complementary or synergistic functions.



Relating this to theft in particular, the designer's primary task is to discriminate between the legitimate and illegitimate possessor in both the possession and the stealthy act of transfer, without interfering with the rest of the design requirements that serve users and other stakeholders.

While the inherent theft contradiction remains valid, there appear to be no strategic contradictions of purpose between comfortable and attractive seating, and crime prevention. But contradictions could exist between requirements of desirability and hygiene: certain crime preventive designs could spoil the appearance or safety of the chair.

#### *When purposes and requirements shift*

Note that purposes and requirements may shift from one category to another. If a carbon tax is imposed on a product whose security function requires energy (e.g. an alarm), then what was a hygiene factor now becomes a desirability factor, namely cost. (The same applies where a buyer or user individually adopts public benefits such as sustainability, and rejects unsustainable products.) The possibilities of insecurity itself becoming a generic taxable element of products are explored by Newman [in CPS]. Treating insecurity from a 'polluter pays' perspective has previously been addressed by Farrell and Roman (ref).

#### *Community safety requirements and purposes*

All classes of product, with the possible exception of those that don't need security, have requirements, and occasionally, purposes for community safety beyond that which is delivered by the simple reduction in risk of criminal events. Thus in a negative sense, their design must not heighten perceived risk of crime or any associated fear or worry (e.g. by over-fortification); and must not stigmatise the object, users or the environment in which it is employed. In a positive sense, the design may be used to reassure people by virtue of boosting their (actual and perceived) capacity to prevent, control or cope with the consequences of crime, or by connecting them to sources of help. It should support, and certainly not reduce, *collective efficacy and social cohesion* amongst the honest community of users and other dutyholders and stakeholders.

#### *Supportive security functions*

To make the security function a practical proposition a range of 'supportive functions' need to be considered.

#### *Minimising harm from own installation or normal operation*

Beyond the particular harms that relate to community safety, the security function of products should be designed from the start to *minimise any harm or nuisance from their own installation or operation*, whether to people, property or profit. In the most general sense harm minimisation is a hygiene consideration – such as ensuring that burglar alarms don't unnecessarily wake the neighbours or mistakenly call out the police. But from a specific crime prevention perspective they should not, through poor design or inappropriate placement and installation, actually *increase* the risk of the crime they are designed to reduce.

All the above harms stem from the security function of the product. There are also possible harms that flow from misuse and misbehaviour, associated with kinds of crime *other* than those the function was designed to protect – for example if a terrorist were to use a bike stand to leave a bomb in a bag in a crowded place; or where a roller blind protecting shop windows itself becomes a target for vandalism, as well as lowering the visual quality of the environment and contributing to general concern about crime (see e.g. [http://www.nytimes.com/2009/12/03/nyregion/03gates.html?\\_r=1](http://www.nytimes.com/2009/12/03/nyregion/03gates.html?_r=1)).

#### *Self-protection of security function*

Designers must also consider supportive security functions aimed at *protecting the main security function itself*. These include:

- *Basic self-protection* of security product against *accidental damage* etc.
- *Basic self-protection* of security product against *incidental criminal misdeeds involving the product itself*.
- *Advanced self/other-protection* additionally conferring self-protection against criminal *countermoves* deliberately aimed at disabling the basic security function – eg anti-pick features on locks. It is possible to envisage an open-ended series of counter-counter-countermoves (Ekblom 2005 M&S) – for example where a professional criminal develops tools to overcome the anti-pick features just described. With cybercrime, the scope for countern moves is far greater, and with the frequency of security updates we are nowadays all familiar with, these can co-evolve quite fast.

## Failure modes

An important task in the design process is ‘stress-testing’ – that is, trying to envisage, and flush out in practical trials, all the different ways in which the design (of security or whatever else) can have adverse effects, or fail in their purpose.

Things can go wrong with designs when they leave the workshop and are exposed to the vicissitudes of the real world. This is true even where self-protective security functions are incorporated. The *failure* of security functions, whether due to deliberate action by criminals, to accident or to wear and tear, could leave users worse off if they had now come to place sole reliance on for their security on the products in question. This is especially significant if the failure was not obvious to users – for example if the lock on changing-room lockers looked secure and still operated, but the internal components had worn and could easily be opened with a screwdriver. Failure could cause additional harm, for example, if physical damage caused injury from sharp edges, or electric shock.

Damage may also affect the security function indirectly – the damaged product could still deliver security but might appear unsightly to the place manager or pose an injury risk, hence it might need to be decommissioned.

For all these reasons, *fail-safe and failure or tamper indication* are necessary functions to incorporate in the design.

Some security failures may happen because the design of the product is hopelessly inadequate. In other cases, there is scope for improvement. *Security-inhibited* objects are those where the basic security properties would be adequate but other properties interfere with them, perhaps by countering the intervention mechanism (e.g. the lock is made unreliable through wear), by weaknesses of implementation (e.g. inadequate mounting) or by inadequate capacity to mobilise people as preventers – e.g. desirability factors which inhibit the intended user from deploying them properly or at all – user-unfriendliness, uncoolness etc.

## Ideal final result

Those of us who make a career from crime prevention are perpetually at risk of exaggerating its importance relative to other aspects of life. This applies with particular force to the design of those products such as cars whose primary purpose is something completely different and where security is a secondary, ‘grudge’ requirement. It is vital not to design so the abuser-unfriendly tail wags

the user-friendly dog. Put differently, we don’t want to design ‘paranoid products’ (ref G n T) where obsession with crime may inappropriately heighten fear as well as incurring unnecessary cost and restriction.

It is vital therefore that designers, and their clients, define *the whole solution to their design problem*, incorporating the security requirement without going over the top. Here it is helpful to draw on the concept of the *ideal final result* (from the TRIZ framework for inventive principles previously mentioned), which can be specified in for example as follows:

A designed product which is

- Effective at its intended primary tasks
- Economical and sustainable
- Easy to manufacture/install/maintain/clean
- Robust
- Aesthetic
- At reduced risk of abuser taking or otherwise manipulating it
- At reduced risk of abuser damaging it in course of crime
- User-friendly, abuser-unfriendly
- Minimising harm from its own action

This way of stating a multi-purpose solution, serving multiple drivers, is developed in detail for the Grippa clips in the case study. Those crime scientists accustomed to a *problem-oriented* approach may find this *solution-oriented* statement rather novel, and indeed a reversal of an almost axiomatic principle (Goldstein 1979) that the problem comes first. However the clash is only an apparent one, because the terms in which the desired solution is couched are really only restatements of desired outcomes – that is, reduction in real-world problems such as crime, and avoidance of simultaneously exacerbating other problems such as inconvenience. They make no presupposition at all about the methods required to realise the solutions in practice.

## Niches for products in the ecology of security

[she niche cover everything to do with context?] [incorp ‘security adaptation’ from wdym?]

So far, discussion has centred on generic security functions. The concept of niches attempts to characterise how the security function within a given product relates to other products, people and places in the human ecosystem. We begin with the exception: products where no deliberately-designed security adaptations are needed at all.

## 'Safe' products – those which need no security

Why would products need no security? They may be of low value or utility to offenders, for example because the value is personal (e.g. sentimental), it diminishes through installation and use or it is fragile or perishable. They may alternatively contain some value to the offender but have *intrinsically securing properties* acting as counterbalance. These properties may inhibit the *transfer process* – for example, they may require excessive effort relative to reward to remove them (e.g. a massively heavy washing machine). Alternatively, they may limit the exploitation of the value – a work of art may be uniquely-identifiable and well known, to boot.

In other cases, products might be of transferrable value but are *externally protected* in some way. They may be intended to be located in a secure environment or enclosure, or one that is remote from offenders; or it is known that their owners will always adequately and capably guard them. Of course, these safe (or 'non-criminogenic') products are only provisionally so. The material from which they are made may suddenly become valuable, or an offender might find a use for them as a tool in crime (my favourite is the handsets in phone boxes in coastal towns of Indonesia, which started being stolen when fishermen found they made a howling noise when attached to a battery, that attracted fish). Owners may start using/installing them in places which are insecure, in ways that were unexpected at the design and marketing stages.

Safety does not just concern instrumental crimes, where offenders are viewed as active, goal-seeking decision-makers. Products are also safe if they do not exert perceptual, motivational or emotional causes by *provoking, prompting or pressuring* offenders to commit crime (Wortley ref). Thus designers will want to ensure the poster does not provoke defacement, the drinks machine does not stimulate frustrated, retaliatory damage; the bottle does not prompt its use as a weapon in a bar fight, and so on. Some of these contradictions may be pretty challenging to achieve, and product design solutions may not be possible – for example it's hard to envisage how to design out the bling of flashy cars to avoid provoking jealousy and consequent risk of vandalism – after all, jealousy is probably what the owners want. One jewellery design did achieve this for robbery risk, although it was not a 'safe' product, but a security-adapted one. It flipped between 'bling' and 'blend' by use of a platinum cover that the wearer rotated to hide the diamonds when they were not intentionally on show (ref).

## Secure and secured products – needing security and receiving it

Where the risk to or from criminogenic products is sufficiently high (and recall that under risk we are considering harm as well as probability of criminal events), action may be taken to reduce that risk. This could be in line with a desire requirement – the owner doesn't want to lose it. It could be a hygiene requirement – collectively, we don't want it to generate police and criminal justice costs by being stolen. Crime risks could be multiple (a product could be mistreated and/or misused, for example), and certain risks may be more important to the various stakeholders than others.

Security can be conferred in several ways, singly or in combination (cf Ekblom 2005):

- The product could be sited in *secure environments*, protected by enclosures and/or people acting as crime preventers. [here or later sep?] Designers can increase the likelihood that it will be thus protected in several ways: by making it ...
- It could be protected by *separate security products* or *securing products* (both covered later).
- It could be protected by *security or securing components*, usually factory-fitted and where product and component are designed or selected to fit one another well, such as the tamper-evident lid on food containers.
- The first three approaches make for a *secured product*. But the product itself could be designed to be an *inherently secure one*, with deliberate *security adaptations* (Ekblom and Sidebottom 2007) to its properties, features and materials. The classic example here is Adam Thorpe's folding Puma Bike (ref/link to pic), whose (diagonal) down-tube is replaced by a tensioned steel cable which can double as a locking device. The feature that is adapted to a security function is one that is moreover *essential* to the main function of the bike – if the thief cuts that, he can't ride home. (This distinguishes it from, say, a product protected only by an engraved identification number, which could be sanded off with possibly little or no impact on the value of the item.) Another example is the hypodermic syringe that can only be used once. Certain *partially* secure products may need adjunct security products, for example the laptop mentioned previously which is equipped with an anchor point ready to take a cable to hitch it to a table leg.

## Securing products – reducing crime against other targets, as a sideline

Securing products have a *primary* purpose plus some *secondary* security purpose. We have already encountered the Stop Thief chair. The dual purposes of bike stands (Chapter X, this volume) are usually more evenly balanced: they have equally to help users to park their bikes safely, so they don't fall over, and securely, so they are not stolen. Another dual-purpose is packaging (see Segato, CPS), which can serve a range of securing functions, including mobilisation (buy this product – it's secure; install and operate it this way), deterrence (package contains alarm) or discouragement (package too big to conceal). Packaging, with its use of energy, materials and landfill raises issues of sustainability (ref Armitage) but this hygiene requirement was met ingeniously, in a design of packaging for a 'hot product'-type torch. Here, the leftover plastic from casting the product was recycled to make the package (ref Seymour-Powell Desco 2000 report).

## Security products – dedicated to reducing crime against other targets

Padlocks, rape alarms, ink-dispensing security tags which spoil stolen goods when thieves attempt removal, and of course Grippa clips, are all security products, whose primary purpose is protecting some other target person or property against crime. The security purpose may not always be one hundred percent of the *raison d'être* of the product – for example some tags double as stock control devices – but it will certainly be primary. Provided that the design can avoid or resolve clashing requirements, the more purposes that a given product can serve, the greater its value-for-money.

Security products constitute a kind of reversal of the types of purpose we have discussed so far. Their primary purpose is in fact one that would be classed as a hygiene or desire requirement on most products. And as will be seen, the entire set of properties that they possess, are intended to support that security purpose and not interfere with its deployment or operation.

Obviously, security products must be self-protected against *accidental damage* and onslaught from the weather etc, which might disable them or shorten their working life. And like any other object, they may even be at risk of being a *target* or a *contributor* to crime themselves, in ways entirely unconnected with their security function. For example, they could be stolen for scrap value or

damaged by casual vandalism; even a crooklock (for securing steering wheel to footbrake) could occasionally be misused as a weapon. So it's necessary to think of the security product *as-object* (covering accidental damage or loss, and incidental crime as target or contributor) as well as *in-function*. (Securing products also have to be considered *as-object*, in *primary function* e.g. as a seat and *in-security-function*.) In order for them to serve their intended purpose, they must therefore be designed to *self-protect* against any crime which incidentally disables their security function. Criminals could of course deliberately seek to disable security/securing products expressly to *remove the protection they are designed to deliver*. Where the probability and/or harmful consequences of this are high this will require them to be designed with *advanced self or other protection*.

Failure of the protective function could also happen if offenders were simply able to bypass the security provided, through some kind of *displacement*.

Security products can reside within the ecology of crime prevention in several distinct ways. They can be *fitted* – associated with *place*, such as Grippa clips, or with *targets*, such as electronic tags stuck onto expensive items on display in shops. They can be portable, associated with preventers, as with personal attack alarms.

## Adaptability of security design

The pursuit of crime- and context-specificity encounters practical limits. The design of portable and movable products in particular faces a strategic choice between making them highly adapted to single contexts versus versatile to a range of contexts, but not quite so well-adapted to any individual one. This 'Jack of all trades, but master of none' dilemma is a pervasive one, that is driven not just by the possibilities of security but the constraints of marketing and manufacture.

## Evolution of security design

Another point worth making in this section is that security functionality may transmute from one niche to another (Ekblom 1995). What begins as an independent security product may evolve into a security component and may end up as a designed-in feature or property. For example, a freestanding security tag may become a specialised factory-fitted component, then a special identity or denial of value function entirely embedded in the software or firmware. More general kinds of evolutionary trend within product design are described in the TRIZ framework (ref).

## Communications and security

To the extent that a communication's message and medium are deliberately designed, they can be classed as products for present purposes. As discussed under mobilisation above, many communications will have security functions – both other-protective and self-protective. Consider, for example, a poster warning against pickpockets, which is wipe-clean against graffiti. It should be possible to map all the above kinds of product onto communications – for example, *inherently secure* communications through encryption; or *securing* communications with a security message tacked onto one with some other purpose – e.g. 'come to the Glastonbury festival, but guard your valuables while you are there'. In many cases, security communications will be an adjunct that supports some other security function – 'turn on your firewall'.

Communication is not confined to explicit textual messages. Whitehead et al. (ref) describe the semiotics of security in mobile phone design, conveyed by the product itself *appearing* secure. [how] The winking red light of an armed car alarm conveys the same message, resembling warning coloration in insects.

## Mechanism

Purpose has ultimately to link to more practical aspects of design. But it is best not to leap straight from high-level purpose to a specification in a technical discourse in terms of properties as realised by construction, materials operating action etc. Rather, to achieve smarter understanding (and more efficient knowledge transfer to other design tasks) requires an intermediate consideration of the causal mechanisms – *how* the design intervention works by interrupting, diverting or weakening those causes. An understanding of immediate causal mechanisms of crime and its prevention is the royal road to analysing risk and reducing it through design.

The frameworks used to understand the causes of criminal events are all available to guide, plan and describe preventive mechanisms manipulable through design. The following account of mechanisms begins with those of classic situational crime prevention, then moves on to the attempt to integrate these, and more, through the Conjunction of Criminal Opportunity framework, and supplements to CCO identified through its application in design. It then considers contradictions at mechanism level,

Once again, restating the designer's task helps to summarise the language and concepts.

## Classic situational prevention frameworks

Pattern theory suggests the designer's task is to identify ways of blocking the conjunction of patterns of geographical coincidence or deliberate planning by offenders which take offenders and targets or victims to the same places at the same time for crime.

Routine Activity Theory suggests the designer's task is to identify ways of blocking the conjunction of likely offender, suitable target and absent or incapable guardians.

The Crime Triangle (ref) similarly suggests reducing risk by influencing targets/victims, places or offenders. Addressing these *conjunctions* alone may not be sufficient because despite preventive efforts offenders may still get through. The three-way frameworks further suggest tackling the properties of the individual elements, but without suggesting how (what makes a target *suitable*?). Other frameworks do, as follows.

One such way of describing preventive mechanisms is to use the Rational Choice Theory's 'view from the offender'. Taking first the 'active agent' side of the offender, the designer's task is to identify issues of risk, effort and reward and attempt to make them unfavourable for the offender. The first is *deterrence*, the latter two are *discouragement*. Either *real* or *perceived* changes in risk etc may be sufficient. From the 'caused' side of the offender, mechanisms covered by the standard canon of situational crime prevention are 'reduce provocations and remove excuses for offending'. A fuller equivalent sees the designer's task as also to manipulate situational precipitators influencing the offender's perception, emotion and motivation.

*Conjunction of Criminal Opportunity as a universal language for describing and prescribing intervention mechanisms*

CCO gives a wider view which, as stated in the understanding section, integrates all the situational approaches, and additional ones on the offender side, offering a broader range of possibilities for designers to draw on. It also combines a focus on the *conjunction* with a parallel focus on the individual causal factors that combine to make it up. This time round, each of the 11 generic causes of criminal events is overlaid by a family of preventive principles whose function is to intervene in those causes. By knocking out one or more of the necessary immediate preconditions of criminal events, or stopping them coming together, those events are made less likely.

The designer's task is to arrange to block, weaken or divert one or more of these causes so the Conjunction doesn't materialise and the necessary preconditions for the criminal event to occur are not met.

Causes and intervention principles of CCO are set out in Table 1. Each principle comprises one or more generic mechanisms. A principle can act on its own (such as achieving discouragement by influencing offenders' perceptions of effort and reward) or in combination with others (such as directly blocking removal of the target by anchoring it to the environment or enclosure).

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
<b>1. Criminality (predisposition to offend)</b> Longer-term psychological features of offender including <ul style="list-style-type: none"> <li>• Aggression</li> <li>• Antisocial attitudes</li> <li>• Criminal self-image or reputation</li> <li>• Habits or standing decisions</li> <li>• Drug addiction</li> </ul>	<b>Reducing criminality through:</b> <ul style="list-style-type: none"> <li>• Early /developmental intervention - tackling <u>risk and protective factors</u></li> <li>• Remedial intervention (convicted/ cautioned/ at risk young people)</li> </ul> At various ecological levels especially <ul style="list-style-type: none"> <li>• Family</li> <li>• Schools</li> <li>• Friends</li> <li>• Treatment in prisons, probation and medicine relating to prevention of <u>recidivism</u></li> </ul>
<b>2. Lack of resources to avoid crime</b> Social and intellectual skills to <ul style="list-style-type: none"> <li>• Avoid conflicts</li> <li>• Exercise self-control</li> <li>• De-escalate fights</li> <li>• Earn a legitimate living and achieve esteem and social inclusion</li> </ul>	<b>Supplying skills to avoid crime:</b> <ul style="list-style-type: none"> <li>• Training offenders in social skills</li> <li>• Training in practical/ work skills</li> <li>• Contacts with preventers - mentors, minders and models</li> </ul>
<b>3. Readiness to offend</b> Short-term influences on people's mood or motivation <ul style="list-style-type: none"> <li>• Current life circumstances including unemployment or homelessness</li> <li>• Needing risk, excitement, esteem</li> <li>• Recent events such as a domestic argument</li> <li>• Being in a particular emotional state such as anger</li> <li>• Being disinhibited through alcohol or drugs</li> </ul>	<b>Reducing readiness to offend</b> <ul style="list-style-type: none"> <li>• Control of disinhibitors eg alcohol</li> <li>• Control of stressors/ motivators               <ul style="list-style-type: none"> <li>• Tackling debt, unemployment, housing problems etc</li> <li>• Resolving prior conflicts</li> </ul> </li> <li>• Satisfaction of psychological and social needs legitimately               <ul style="list-style-type: none"> <li>• Esteem</li> <li>• Inclusion</li> </ul> </li> </ul>



<p>4. Resources for committing crime</p> <p>(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"> <li>• Skills</li> <li>• Inside knowledge</li> <li>• Repertoire of Modus Operandi</li> <li>• Tools</li> <li>• Weapons</li> <li>• Transport</li> <li>• Ability to overcome moral inhibitions</li> <li>• Physical strength and social skills for intimidation/deceit</li> <li>• Access to trusted network of collaborators (crime promoters)</li> </ul>	<p><b>Restricting resources</b></p> <p>Control of/ screening for/ design of</p> <ul style="list-style-type: none"> <li>• Weapons</li> <li>• Tools</li> <li>• Information on target's attractiveness and vulnerability</li> <li>• Know-how/ MOs</li> </ul> <p><b>Control of criminal organisations:</b></p> <ul style="list-style-type: none"> <li>• Recruitment</li> <li>• Growth</li> <li>• Efficiency</li> </ul>
<p><b>5. Decision to commit offence</b></p> <p><b>Offender's immediate anticipation of / response to</b></p> <ul style="list-style-type: none"> <li>• Risk</li> <li>• Effort</li> <li>• Reward</li> <li>• Conscience</li> <li>• Provocation</li> </ul> <p>And more strategic decisions on whether this kind of crime, or the criminal career, are worthwhile</p>	<p><b>Deterrence</b></p> <ul style="list-style-type: none"> <li>• Increase perceived risk of getting caught</li> <li>• Increase perceived costs of getting caught <ul style="list-style-type: none"> <li>• Formal – arrest and punishment</li> <li>• Informal – shame</li> <li>• Personal – guilt</li> </ul> </li> <li>• Discouragement <ul style="list-style-type: none"> <li>• Increase perceived effort</li> <li>• Reduce perceived reward</li> </ul> </li> </ul>
<p><b>6. Offender presence in situation</b></p> <ul style="list-style-type: none"> <li>• Routine activities of offender</li> <li>• Crime attractors – motivated to look for crime there (see environment, enclosure)</li> <li>• Free to enter or circulate in crime situation</li> <li>• No detectable traces left</li> </ul>	<p><b>Excluding offenders from crime situation</b></p> <ul style="list-style-type: none"> <li>• Segregating conflicting groups</li> <li>• Closing roads and paths</li> <li>• Attracting offenders elsewhere</li> <li>• Exclusion of specific offenders</li> <li>• Enhancing traceability</li> </ul>
<p>7a. Target property</p> <p>'Hot product' (Clarke 1999) Object, service, system or information that is</p> <ul style="list-style-type: none"> <li>• Concealable</li> <li>• Removable</li> <li>• Accessible</li> <li>• Valuable</li> <li>• Enjoyable</li> <li>• Disposable</li> </ul> <p>(Mobile phone = typical example)</p>	<p><b>Reducing target vulnerability/ attraction</b></p> <ul style="list-style-type: none"> <li>• Target hardening</li> <li>• Concealment</li> <li>• Target removal</li> <li>• Value reduction</li> <li>• Reducing provocativeness</li> <li>• Property identification</li> </ul>
<p><b>7b. Target person</b></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"> <li>• Vulnerable</li> <li>• Accessible</li> <li>• Provocative (take care over this!)</li> </ul>	<p><b>Reducing target vulnerability/ attraction</b></p> <ul style="list-style-type: none"> <li>• Target absence/avoidance</li> <li>• Reducing provocation (careful)</li> </ul>

<p><b>8. Target enclosure</b> Compound, building, room, container, ATM lobby that is</p> <ul style="list-style-type: none"> <li>• Vulnerable to penetration at its entry point or its boundary</li> <li>• Has a vulnerable interior</li> <li>• Contains attractive and vulnerable targets</li> </ul>	<p><b>Perimeter/ access security</b></p> <ul style="list-style-type: none"> <li>• Adding enclosure and access</li> <li>• Control of perimeter</li> <li>• Control of access</li> <li>• Screening at entrances/ exits</li> <li>• Control of interior</li> </ul>
<p><b>9. Wider environment</b> Housing estates, town centres, transport interchanges, which encourage crime because they are: 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"> <li>• Concealment/surveillance (sight / sound)</li> <li>• Rationale for legitimately being present – ‘cover’</li> <li>• Escape/pursuit</li> <li>• Presence of promoters offering support/ turning blind eye</li> </ul> <p>May <u>attract</u> the offence, or <u>motivate</u> it through the presence of</p> <ul style="list-style-type: none"> <li>• Attractive or vulnerable targets</li> <li>• Conflict – such as a place where rival gangs fight for control over drug outlets</li> </ul>	<p>Environmental design and management</p> <ul style="list-style-type: none"> <li>• ‘Defensible space’ principles</li> <li>• Aiding surveillance</li> <li>• Intelligently planned lighting</li> <li>• Setting/ communicating rules</li> <li>• Conflict reduction (eg sound insulation)</li> </ul>
<p><b>10. Crime preventers</b> 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"> <li>• 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)</li> <li>• Intervening during the criminal event</li> <li>• Reacting after it (to make <u>next</u> event less likely)</li> </ul> <p>Factors which</p> <ul style="list-style-type: none"> <li>• Alert</li> <li>• Motivate and</li> <li>• Empower preventers (resources including knowledge, skills, tools, eg forensic kit, CCTV) and perhaps</li> <li>• Direct them (objectives, standards, regulations)</li> </ul>	<p><b>Boost preventers’ presence, competence, motivation/responsibility</b></p> <ul style="list-style-type: none"> <li>• Extra surveillance of enclosed and wider environments</li> <li>• Aids for preventers - alarms, CCTV</li> <li>• Cultivating/ protecting witnesses and informants</li> <li>• Informal social control</li> <li>• Formal control</li> <li>• Self-protection and avoidance</li> </ul>
<p><b>11. Crime promoters</b> Make crime <u>more</u> likely, by unwittingly, carelessly or deliberately</p> <ul style="list-style-type: none"> <li>• 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)</li> <li>• Intervening during the criminal event (giving encouragement, distracting the victim or preventers)</li> <li>• Reacting after it (helping dispose of stolen goods and weapons, providing an alibi etc)</li> </ul> <p>Factors which</p> <ul style="list-style-type: none"> <li>• Lull</li> <li>• Deter and discourage</li> <li>• Hinder promoters including denying them resources</li> </ul>	<p><b>Discouraging/deterring promoters:</b></p> <ul style="list-style-type: none"> <li>• Naming and shaming</li> <li>• Civil/ criminal liability</li> <li>• Tackling a criminal subculture</li> <li>• Market reduction for stolen goods</li> <li>• Procedural controls</li> </ul>

Continuing with our Stop Thief chair example, we focus here on the secondary purpose of security, using CCO terminology:

#### The chair reduces the risk of bag theft

- Directly through physical anchorage of the target bag to entities in enclosure or environment.
- Directly through surveillance and reaction by the owner and others acting as preventers.
- Indirectly, by deterrence through increasing the offender's perception of risk of being detected and caught in the act.

The risk of detection is enhanced by locating the bag and its point of anchorage in a place within easy surveillance of the owner, where movements of other people are unlikely and where immediate emotional reactions to invasion of personal space may be provoked.

CCO does however need supplementing and extending if it is to be of most use, as the experience of the bike parking project indicated (ref WPA2). It's necessary to consider system mechanisms, the dynamics of scripts and script clashes, and the linking of scripts and wider perpetrator techniques to risk factor approaches.

#### *CCO supplemented – system mechanisms*

The security function of a product may work in a relatively simple relationship with the items protected (for example the anchor cable linking laptop to table-leg). Alternatively it may operate as part of a wider, designed security system (for example, the embedded RFID (radio frequency identification) chip that communicates with an electronic article surveillance system, which covers all exits of the shop). In such cases, the description of the intervention cannot be reduced to the sum of the individual elements of CCO that are influenced by design. (Note that we may need a description of a security system embedded in the naturally-occurring complex adaptive system as previously mentioned.)

#### *CCO supplemented – scripts and script clashes*

The subtlest, best-attuned interventions may come with combining the CCO's mainly static view of causes and interventions with the more dynamic picture offered by scripts and script clashes (ref Bikeoff wpa report). Recall the following: the designers' task is to arrange the situation by manipulating the design and configuration of entities in it, To favour the user over the abuser in each of these

tactical clashes in terms of the shifting dynamics of risk of harm, effort, reward.

#### *CCO supplemented – product-related risk factors*

The kind of *risk factors* which characterise hot products (concealability, removability etc) are cast in terms that are *functional to offenders* pursuing their foraging agenda of risk, effort and reward. They readily slot into scripts and script clashes (e.g. 1) remove target, 2) conceal target, 3) escape undetected, 4) enjoy target).

The designer's task is to use known risk factors to cautiously forecast which products need greater security, against which crimes in which contexts; and where possible to address those risk factors directly by design – for example, making something less valuable or concealable – where other requirements allow.

[return to extend the chair example?]

#### *Contradictions at mechanism level*

There may be contradictions between different crime prevention mechanisms. For example, what may reduce robbery in a particular place – supplying preventers by encouraging many more people to use it – may increase pickpocketing. Contradictions may occur within attempts to address a single crime problem. Reducing concealability of a target at the theft stage of an offender's script is good for prevention (the offender finds it harder to escape undetected with the loot), but reducing concealability at the *seeking* stage, when offenders are scouting for potential victims carrying valuable items, is good for crime. How can designers make the product easy to conceal at one stage, whilst hard to conceal at the next? (The example gets even more challenging if theft at the retail stage is also addressed – but here, at least, packaging can help.) [Segato?] The access control supplied by a high garden wall to a house may reduce the crime risk by influencing the offender's decision to attempt to get over it and reach the insecure back door (the effort, risk of injury and risk of being spotted are greater). But if the offender is equipped to climb over it, the resulting concealment may *increase* the risk. (The technical-level resolution enabling both access control *and* surveillance simultaneously is to have a fence which is see-through.) These are all challenges to designers.

#### *Mechanisms involving preventers*

Security mechanisms may work upon the causes of crime

in a *direct* way – physically blocking access or removal, say, or lowering the intrinsic value of the loot to the offender. Additionally or instead, it may work *indirectly*, via *involvement of people*, mobilising them in some way to act as crime preventers and guard the objects. We have seen this with the Stop Thief chair, where the user is intended to hitch their bag beneath their knees. In this case, humans have become a designed-in part of a simple security system, both physically and cognitively.

Direct blocking is an instance of *situation shaping* – the entire intervention is in place in advance, before the criminal attempt happens. This has the advantage, if it works, of heading off the attempt before there is any damage or confrontation – a preventive principle applied by insects with warning coloration (E 1997, 1999; Felson 200x). Preventers may contribute to this for example by installing a security product, or utilising one that is in place. Alternatively, shaping the situation may enable a subsequent, human, *real-time intervention* – for example where a burglar is detected when breaking into a building.

There are cases where the need for human preventers is explicitly designed out, on grounds of convenience and reliability – who wants to have to remember to safely telescope their car aerial away on leaving their vehicle, when the aerial can now be embedded in the window glass? But in many cases, the adaptability of human preventers and their capacity to take further action as needed, is an important element in a security function. This is especially so when the nature of the preventer's further action may not be fully predictable to the offender, and conversely.

Where human preventers are involved, the causal mechanisms by which security works are many. At the simple end of the scale, an alarm might merely draw the attention of a preventer acting as guardian of a target (for example, a movement alarm in a laptop). The resultant angry challenge might *disrupt* the offender's action, or influence the offender's *anticipation* of this danger (in other words, perceived risk), which may be enough to deter the attempt. In the middle of the scale, the preventer might be mobilised to take some specific action such as locking their door – supplying a physical block – or turning on security lighting. Again, taking a bike stand as example, one might envisage the deliberate design of a functional system of bike stand, bike lock, bike and a user expected to operate the lock and employ the stand in a predictable and secure way. (In fact, the CaMden bike stand, as described in Chapter X of this volume, is expressly designed to direct the user to lock securely,

namely locking both wheels and the frame to the stand. Insecure locking, by a single D-lock or cable connecting cross-bar of bike to the middle of the stand, is rendered difficult by the 'M' shape.) At the complicated end of the scale, preventers have the open-ended potential, on their own initiative, to activate the entire range of preventive mechanisms – including mobilising some other agent (such as the police) to take action of their own.

In effect, we have a process of prevention comprising several possible levels and stages. At minimum, the security function *directly protects* the target of crime from misappropriation, misuse and so on. Alternatively, it *mobilises other people* to act as preventers in the immediate crime situation, and they use the product to help them guard their property, undertake surveillance or whatever. The process of mobilisation itself, and how design might influence this, is discussed in more detail next.

#### *Mechanisms for mobilisation of crime preventers*

How people are mobilised to act as crime preventers is a major practice domain of crime prevention in general. Using the terminology of the 5Is framework (a process model for crime prevention related to SARA – refs inc E2005) professional crime preventers seek to Involve other people in Implementing the Intervention. (Involvement as a whole includes not just mobilisation but *partnership* and *climate setting*. The former is relevant to processes of co-design; the latter to wider attitudes and expectations among stakeholders and dutyholders which may render a good design, or a particular design approach, accepted or rejected.) Designers, as we have seen, must work within this context – as well as seeking to influence the behaviour of offenders they have to influence that of the other agents – preventers and promoters – who in turn will either influence the offenders directly or indirectly, by their own interventions in the immediate crime situation or at times and places causally upstream.

As indicated in the section on understanding, designers must build on traditional analysis of stakeholders and dutyholders, and user-centred design, to develop an understanding of all the players in immediate crime situations, in their civil as well as crime-related roles, and allow for their interests and capacities in their design. On the prevention side, they should ensure their designs work with the motives and capacities of individual people and organisations rather than undermine them.

Classical situational crime prevention supplies, in

its customary way, a simple heuristic approach to understanding preventer roles. A second, outer, layer is built around the Crime Triangle (ref www) to indicate that professional preventive practitioners should consider the *guardians* of targets, *managers* of places and *handlers* of offenders (people who may act as their controlling conscience).

A richer and more open-ended framework for both understanding and guiding mobilisation of preventers (and also demobilisation of promoters) is CLAIMED (ref; earlier, CLAMED (e.g. KP cracking crime)). This, in fact, emerged from a distillation of the research on design against crime commissioned for the UK Crime Reduction Programme (ref desco 2000; CPS20); it soon became clear that it applied across crime prevention as a whole, but here it returns to its origins. Mobilisation can be seen as a series of distinct tasks:

- Clarify crime prevention tasks/roles that other agents (individuals, organisations) need to do for the design to be successfully installed and operated.
- Locate appropriate agents in and around crime situation capable of taking effective responsibility, using the kind of analysis of civil roles, their interests and capacities suggested above... then determine what may be constraining/motivating preventers, enabling/motivating promoters.

...then identify methods which

- Alert and
- Income them about crime issue & their part in it as preventers/promoters
- Motivate them to take responsibility for prevention/cease promotion
- Empower them (with resources – eg knowhow, security kit, authority)
- Direct them (eg with regulations, standards, constraints)

Applying this framework to design, these tasks can be applied in the early stages of the process where researching and developing an understanding of the causes of crime and the causal roles of various agents is important; and in the later stages of focusing, creating and developing solutions, where design can influence not just the main operation of the evolving product but the wider domain of human factors. Describing the design rationale requires one or more CLAIMED statements if the preventive intervention works indirectly, via influencing people.

There are many ways the designer can alert, inform, motivate, empower and direct people to become (better) preventers, to cease being promoters or to flip from careless promoter to careful preventer.

*Communications design* is obviously central to mobilisation. It can alert and inform people of crime risks, make them wise to perpetrator techniques (ref/illustrate), inspire them through fear, duty or awareness of regulations to take on the preventive role, and empower them by telling them how to operate the security function on their product. (Communications can also send intentional or unintentional messages to offenders, and a particular design challenge is to ensure that these and the messages to preventers/promoters don't interfere.)

Alerting by itself can be achieved through various lights, sounds or popup windows to remind them of the risk and what they should do to counter it. Motivation can be achieved, for example, by reward, even by fun. When litter is posted into the 'world's deepest rubbish bin' [www.rpmgo.com/volkswagens-newest-fun-theory-video-reveals-the-worlds-deepest-rubbish-bin](http://www.rpmgo.com/volkswagens-newest-fun-theory-video-reveals-the-worlds-deepest-rubbish-bin), it delivers a long, screaming bomb-dropping noise followed by a thud apparently far below. This is claimed to increase the proper deposition of litter. Direction can be achieved through incorporation of physical or electronic constraints to ensure correct installation/operation of design. The CaMden bike stand (ref – this volume), for example, guides the user to lock in ways that research has shown to be more secure, namely locking both wheels and the frame at each end of the stand (one lock in the middle of a conventional 'goal'-shaped stand can be twisted off using the bike as a lever in its own theft)

However well it performs its security function once in place and activated, a product is no good whatsoever if it remains un-manufactured or un-marketed, unsold, uninstalled and unused. (And examples abound of burdensome security being bypassed – for example the child lock on a video player described in [Desco report 2000] where service engineers simply gave out the bypass technique to the hordes of customers who had lost the PIN code, or the anecdotal entryphone system disabled by residents by propping the door open with a fire extinguisher.) As with most crime prevention, there is an *implementation chain* leading ultimately to the realisation of the designed intervention and the hoped-for activation of its preventive mechanisms. This may involve a succession of performances of many agents, whether individuals or organisations, undertaking many tasks. For example, a mobile phone once designed has

to be marketed, stored, distributed, sold, purchased, and the security functions such as password protect activated by the user. (Stages such as wholesale distribution and retail will have their own crime problems to address too, perhaps with the aid of design of the product itself.) On disposal, the phone obviously should not regurgitate the late owner's data, nor (if not visibly broken) should it be possible to re-sell it by passing it off as working. Ideally it should not be discarded as ordinary litter but recycled as electrical/electronic waste. The designer has to anticipate and influence each of these performances to make the product attractive over its whole life-cycle and distribution-cycle: security functions must not jeopardise the many other requirements for safe and efficient transport, sales, installation and after-sales service etc. Seen from this angle security itself has its own desire requirements.

### Technicality

Technical descriptions state how the causal properties of the product, which contribute to the mechanisms of prevention described above, are realised through construction, manufacture and operation. *Construction* is about materials, structure and features of the design. *Manufacture* is about how it is made. *Operation* is about how it acts in tangible terms such as keys turned, cards swiped, actuators releasing locks, or bag owner's legs fastening or releasing bag handles on the Stop Thief chair.

To continue with the chair example, the stated preventive mechanisms of the chair are supported by the incorporation of a sawn twin notch feature in the leading edge of the seat part, over which the bag handle is placed by the user/owner, the bag then being anchored due to its handle being enclosed between the seat and the back of the user/owner's knees. In operation, obviously enough, the bag owner hangs the bag on the seat notches, then sits down. To release the bag the owner simply stands up and slides the handles forward out of the notches.

In a sense, when we enter the technical realm we haven't completely left causal mechanisms behind. Rather, we have changed perspective from mechanisms underlying human action to the mechanisms of physics, chemistry and perhaps IT. For example, how the friction of the seat notches holds the bag handles in place against the thief's attempt to pull the bag, how the configuration of the seat puts the bag in the owner's personal space and peripheral vision; or in other technical methods how the sensor detects movement, how the software discriminates between, say, cat and burglar, and how the anti-graffiti coating stops the adherence of paint from spray cans.

There may be diverse *contradictions* at technical level. With the Stop Thief chair, material contradictions may relate, for example, to robustness versus weight and cost of wood. Structural contradictions may include how to cut notches big and deep enough to receive and secure the bag handles whilst not weakening the weight-supporting function of the chair seat. Manufacturing contradictions may relate to efficiently and accurately cutting the notches without creating rough edges which may catch users' clothing, and with a low proportion of rejects.

### Four-level description – overview

In sum, an abbreviated four-level description of security design could say something like this:

**1 (security niche)** The Stop Thief chair is a *securing product*, **2 (purpose)** designed with primary purpose to serve as a fully functional and appropriately-styled chair, and secondarily to reduce the risk of *theft of customers' bags* in places like *bars and restaurants*, **3 (mechanism)** by physical *anchorage* of the target bag differentially easier to release by the bag-owner, by mobilising *usage of the security function of the chair*, and the *surveillance and reaction* that it favours by the user/owner and others acting as preventers; and by *deterrence* through increasing the offender's perception of risk of being detected and caught in the act. This is achieved **4 (technically)** by the incorporation of a *twin notch feature* cut or moulded in the leading edge of the seat part of the chair, over which the bag handle is placed by the user/owner, the bag then being anchored due to its handle being enclosed between the seat and the back of the user/owner's knees.'

The complete description of the design of secure or securing products must of course go well beyond security and crime considerations. How it satisfies other purposes and requirements, perhaps resolving troublesome tradeoffs between security and desirability factors such as convenience, safety, economy and style, are all key to the wider design process. If all this is inadequately addressed, then there is little point in getting the crime prevention requirement right!

### Variations in description of security

Different levels of the description may be emphasised for different purposes. The description, emerging as a living document, could help to guide the development of the design, serving to reflect, clarify and communicate the evolving thinking and iterative production and testing



process. Obviously it would start out with purpose, and niche, mechanism and technical description could be incorporated as these emerged. This would not be a neat linear progression – probably a messy to-ing and-fro-ing, with leaps of creative intuition alternating perhaps with more analytical thinking in which ideas were generated, tested and revised or abandoned.

A full four-level description would be needed in reporting on the finalised design, demonstrating how it met its stated requirements. In certain respects, this also resembles the language employed in patent claims. Whether an abbreviated statement of the kind presented for the chair will suffice, or a far fuller one as done for the Grippa in Part 2, would depend on circumstances.

Where the aim is to supply *guidance* to designers to come up with their own designs, the description would obviously need to stop short of telling them exactly and exhaustively what to do – they would no longer be creative designers but manufacturers! *How* short would depend on circumstances. If designers were being advised on how to adapt their own chairs, for example, a mainly technical specification could be given about the depth and separation of the notches. (In fact, in the early stages of the Stop Thief chair project, a physical template was produced to guide, not designers, but carpenters and others in cutting their own notches – a case of building operational capacity.) If they were offered more generic guidance on how to design chairs to protect bags, they might be advised on purpose and likely mechanisms (a functional specification) to activate (plus some account of the design conflicts they were likely to have to address, such as safety and other hygiene requirements). They would be given greatest design freedom of all if they were simply given as a brief, the purposive requirement alone – make your chair reduce theft of bags from people seated in bars; or even reduce bag theft in bars.

Finally, *standards* could use these descriptions in various ways. *Technical* standards could specify, for example, the type of materials or the separation of the twin notches. *Performance* standards for security could relate purely to the purpose (for example, a chair which reduces the risk of theft by a certain amount). Alternatively they could be *functional*, relating to both purpose and mechanism (for example, a chair that reduces risk of theft by securely locking the bag in conjunction with the user's knees).

The present exercise, which has centred on material products, is not the end of the story. Design of security within cyberspace in particular requires concepts and

terminology that support the exacting logical requirements of software programming. This is not an esoteric corner of product design. As noted previously (Ekblom 2005), the trend towards pervasive computing means that progressively more things – household goods, furniture, even clothing – will contain chips variously handling identification, sensory and communication functions serving a range of main purposes. The security function of products will increasingly be realised wholly or partially via such processors, sensors and actuators, acting alone or communicating via the Internet or Bluetooth. The scope for embedding a security function into products relatively painlessly and economically widens enormously if all that has to be added is a software application. But the scope for getting it wrong – failing to deliver security and perhaps even making things significantly worse – is equally wide.

#### *Relating the technical side of design to crime science concepts and terms*

One of the aims of this paper/report as a whole has been to build interdisciplinary bridges between design and crime science. The coverage so far has left a few gaps which can be filled in here.

In more general crime science terms we can define the *preventive method as a tangible and practical realisation of preventive principles, designed to release certain preventive mechanisms in certain contexts*. A technical description of a product design with a security function therefore has something in common with the equivalent description of a method so defined. It can in fact constitute a key component of a preventive method, especially if the operation of the design is included. But a product design is never 100% complete as a description of a preventive method because methods involve *wider procedures* as well as entities and agents – so 'a Stop Thief chair' would not be a complete method but 'install and use Stop Thief chairs' would be.

Methods may operate via several generic preventive principles and release diverse mechanisms. The Stop Thief chair, for example, may work by altering offenders' perceptions of risk, and by blocking access to the bag (the seated owner and the chair together anchor the bag in a protected enclosure). In classic situational crime prevention the high-level principles of increasing the risk, effort and guilt feelings to the offender of committing crime, and reducing the reward and provocation, can be mapped onto the 25 techniques of situational prevention (ref). These techniques are themselves medium-level principles such as 'harden targets' and 'control access

to facilities' which in turn organise a collection of individual methods such as 'tamper-proof packaging' and 'electronic card access' respectively. These methods in turn will operate through particular mechanisms in interaction with the entities and agents in their working context. Each individual method will have its own detailed technical realisations. Selection of techniques and detailed realisation of individual methods would be expected to differ to suit different contexts. [think more about whether a method is the final realised construction or something still in some way generic]

But the dynamics introduced by adaptive offenders (or indeed of other agents) means that there can never be such a strict 'silo' segmentation of the columns of the 25 techniques as the table implies. For example, where a preventive method attempts to increase the risk to the offender, *if the reward is high enough* the offender may respond by increasing the effort (taking more time and care to circumvent the surveillance cameras).

### Conclusion to Part 1

The practice of design against crime is still developing, and its concepts are still evolving. Not all those involved in the area may agree with the specific proposals suggested here – although hopefully they would agree with the need for a common language and framework. But at least we have made a start in what should be a reflective, collective and constructive debate and progressive accumulation of ideas in the field.

## Part 2. The Grippa clip: case study of a security product

Having set out the framework for describing the design of the security function of products, as ‘mechanisms with purpose’, it is now time to illustrate that framework to describe the security design rationale for the Grippa clips. As well as reporting on a specific research and development project, this serves to illustrate the complexity and challenge of the design against crime task, the ongoing progress in weaving together design and crime science, and the contributions made by various kinds of design- and crime science-related approaches to research and practice. It also tests out the capacity of the four-level description and associated frameworks to handle the tasks for which they were developed.

Note that this is a description and discussion of how the Grippa is *intended* to function. Although it incorporates findings of various user-testing exercises, it is not an evaluation of the impact of the Grippa on crime. That is presented separately. [in another report/chapter?]

The description begins with brief accounts of the background to the case study, as a funded research and development project; the sources of information and experience drawn upon; and the research and design process. Fuller reports of these are available elsewhere, as indicated below. It then continues with the ‘meat’ of the case study, namely the four-level description of the Grippa as a security product. (The levels are presented in slightly different order to their exposition in Part 1 for purposes of efficiency of presentation: Security niche, purpose from diverse perspectives, mechanisms and technicalities. To a large degree the last two are merged given the way the latter intimately realises the former. The mechanisms and technicalities section covers both the nature and patterns of theft in bars, plus an analysis of its causes, before moving on to describe preventive intervention mechanisms.

### Sources of information

Diverse sources of data and experience contributed to this study and development project:

- Generic familiarity with situational crime prevention theory and practice
- Experience of various team members on a range of design against crime projects (including designing crime-resistant handbags and related accessories, bag-protecting café chairs, and crime-preventive bike stands (refs/links))
- An earlier development and trial of prototype Grippas

- Observation of prior art – police-designed Chelsea clips – looking at both design and usage
- Discussions and design workshops with police crime prevention design advisors and bar staff and management, and studio projects (MA Industrial Design) with students, police and designers contributing to briefing and critiques
- Collaboration with manufacturers to select appropriate methods of production of prototypes
- Appreciation and direct experience of business context for manufacture and marketing of security-related products
- Surveys and observation of bar contexts before and after installation of clips, in two bars in London; and a further two bars observing results of trial installation in Barcelona
- Analysis of patterns of bag theft from police recorded crime statistics covering 2005-9, supplied by Metropolitan, City of London and British Transport Police forces
- Attempted custom-recording of incident details within bars

### Research and design process

[tba]

### Grippa’s security niche

Grippa, obviously, is a *security product* – that is, its *primary function* is to *reduce the risk of crime* targeted on other entities and the people that own them. This means that every aspect of its design becomes relevant for security purposes, even desirability properties such as aesthetics, and hygiene properties such as sustainability. If neglected, these security inhibitors could frustrate the security purpose as effectively as a failure of design of the primary security function itself. Clips of inappropriate style would not be bought and installed, hence could not reduce crime – unless the unopened boxes of clips happened to fall on passing bag thieves.

To go further, Grippa is a *fitted* product rather than a portable one. And it is designed to be *retrofitted*, although it could readily be factory-fitted or even evolve into a *security component*. For *marketing* considerations the Grippa is designed to be *versatile and adaptable* in fitting a wide range of furniture shapes and styles rather than *highly adapted* to a single niche. It does this, as all security products do, in conjunction with other physical entities and human agents in its *intended working context*, to be described below.

It's possible to zoom out to a wider perspective. Tables fitted with Grippas could be considered to be *securing products* whose primary purpose is somewhere to sit at, and whose secondary, security, purpose is as below. The bars in which the fitted tables are sited, could be considered as *securing enclosures*, particularly if the Grippas are combined with *security communications and securing practices* of bar staff.

### Rival occupants of the niche

Other products have occupied the same niche as the Grippa. The Chelsea clip [Pic] is an earlier, police-designed equivalent which in fact stimulated the development of the Grippa, through its manifest failure to be used and limitations of design. Failure to be used was evidenced by [Loll describe Upper St survey]. Design limitations [?] will be covered at relevant points below, but centred on weakness and breakage of its jaws, limited gape and (being positioned right beneath the table top set back from the edge) invisibility to users.

Portable security products such as the prize-winning [name] designed by CSM student Sara Bellini (link) act for equivalent purpose and by similar direct preventive mechanisms to the Grippa, only they are carried and fitted, by sliding onto the edge of the tabletop, by the bag-owner. (A range of such portable clips are reviewed at [www.inthebag.org.uk/what-can-you-do/bag-holding-clips](http://www.inthebag.org.uk/what-can-you-do/bag-holding-clips).) The advantage is that they empower already alerted, informed and motivated users, so are more likely to be used, and used well and successfully. The disadvantage is the limitation to the security coverage of tables and bars – unless such products become very popular most will be unprotected.

### Purpose

Being a security product, the primary purpose of the Grippa is to *reduce the risk of theft (misappropriation) of bags from customers seated at tables in places of public resort* such as bars, cafes or libraries. But underlying this deceptively simple statement is considerable divergence of purpose when we consider the perspectives of different stakeholders and dutyholders such as bar owners/managers. As will be seen, this diversity influences not only primary purpose but desirability and hygiene requirements.

### Purpose from the immediate user's perspective

We take as the immediate user, the customers whose bags

are at risk of theft (hereafter, bag-owners).

### Primary and secondary purpose

Bag-owners want to reduce the risk of loss of bag and contents. The fact and discovery of victimisation from theft is in itself likely to be an unpleasant experience. The event may bring with it a range of harms including sentimental and financial loss, crime proliferation (e.g. mishandling of bank cards) and sheer hassle (finding how/where to report the crime, stopping and renewing bank cards, changing locks etc). Findings from the British Crime Survey (BCS) are in generalised categories and can only give a broad idea of the costs of theft of/from bags in bars [...]

Other *quality of life/community safety* harms more broadly associated with the theft problem include an inability to relax in similar venues, whether in anticipation or recollection of theft events. Given that we are describing a security product, then theft prevention, obviously enough, is the Grippa's primary purpose for the bag-owner. Helping bag-owners feel safe enough to enjoy themselves – reassurance – may be a secondary community safety purpose, although it would be important not to make them feel so safe they relied entirely on technology and dropped their guard.

### Desirable requirements

The following requirements were identified on the basis of four sources of information: 1) intuitive attempts of the research/design team to think like bar customers (indeed we have all been customers, and have moreover been sensitised to bag security issues by virtue of working on the project); 2) research into crime patterns in bars (ref); 3) trial iterations of Grippa table mock-ups in workshops with bar management, police and design students; 4) [x] interviews and observations on pilot trials of Grippas in two bars in London and two in Barcelona (refs); and 5) observations of functionally-equivalent Chelsea clips in real-world use and under scrutiny for design and construction.

Customers want:

- Easy, intuitive operation of clips
- Capable of protecting a wide range of sizes, shapes and weights of bag (unlike the Chelsea clip whose gape and strength were limited by form and materials)
- more?

Customers want to avoid:

- *Injury* to themselves or damage to their bags and clothing *directly* from the Grippa, whether its mere presence (e.g. bruising or scratching from the projecting clip) or its operation (e.g. trapping fingers)
- The same, *indirectly* from tipping table and contents (due to extra weight), or in case of breakage (e.g. bag drops to floor upon breakage, sharp stump remains under table); tripping on bag when rising from/approaching seat, or bag getting kicked, trampled or scuffed by self or others when held in particular positions on or above the floor
- *Nuisance* from effort to hitch/unhitch bag, not just on arrival/departure, but if going to the bar to order a drink, visiting the toilet, popping outside for a smoke etc
- *Forgetting bag* on leaving bar
- Acquiring an 'uncool' or otherwise *inappropriate image* from being seen to be concerned enough about crime risk to use the Grippa
- *Adverse ambience* – wider harms from the sight of obvious security products conveying the feeling of being beleaguered by crime, or the lesser harm of having to view unattractive fittings in the bar
- Costs of Grippas passed on as higher price of drinks
- ...[how much at this stage or later?]

### Hygiene requirements – society perspectives

Society's interests were variously represented by agencies such as the police and embedded in national/local government policy. This information was obtained by informal discussions with police design advisors and crime reduction teams, a familiarity with government policy in terms of published literature on crime strategy, and awareness of other policy issues across government. [anything from contacts with local govt ?] Requirements include:

- Avoiding all the costs to taxpayers of crime and insecurity, and moral costs of leading potential criminals into temptation. According to the British Crime Survey (ref), [there are xxx thefts from the person of which a good proportion may occur in bars. Latest figures of costs of crime suggest the public costs of xxx crime type, which includes bag thefts are yyy]
- Avoiding excessive use of energy or raw materials, and creation of waste from manufacture and distribution; promoting recycling at end of life
- Safe and clean in terms of health & safety (e.g. no trip injuries), and public health

- Supportive of any local social/economic regeneration strategies (encouraging custom and improving area reputation)
- Inclusive e.g. usable by elderly or disabled

### Purpose from the bar management's perspective

This information was obtained from informal interviews with bar staff, bar managers and senior district managers of the collaborating bar company; also from workshops at which they were variously presented with (crime analysis) research findings, and mock-ups of Grippas on tables which they were able to try out and discuss with the designers and others. It was supplemented by our own informal 'business thinking' knowledge and exercises.

It's important to note that the purposes and requirements of the bar company are not homogeneous. The people serving behind the bar and dealing directly with victims and others, perhaps in a context of limited company loyalty and short-term employment, will likely have a different set of priorities and perceptions from the middle or senior managers.

#### Primary and secondary purpose for bar management

The bar company's primary purpose has to be to *make profit* and to do so continuously without impediment or interruption. A secondary purpose may be positive enhancement of *corporate social responsibility and company image or reputation* – arguably these are mainly supportive of profit rather than independently motivated for their own sake. A more day-to-day purpose, also in part supporting profit-making, is to *minimise hassle* and fruitless use of staff time and attention.

The most important issue is why a bar company would want to install Grippas or their equivalent at all, when the main benefits arguably accrue to customers. Certainly in so doing there are risks to the company's profit and image to be considered; these are discussed under 'desirability' below. Possible positive reasons include:

- Attracting more customers by virtue of image of improved security and customer care
- Avoiding loss of customers through unpleasant theft experiences associated with that venue
- Avoiding hassle from customers who, on discovering their loss, take up time of bar staff
- Alleviating/averting the attentions of police and/or health & safety officials seeking to reduce a bag theft problem, which may generate detriments ranging from hassle to, in extreme cases, risk of loss of licence
- Enhancing company image of CSR

Some of these purposes could be *collective* – for example if a particular neighbourhood as a whole acquired the reputation of a theft hotspot to be avoided by customers, all bars would have a common interest in helping to reduce theft. Others would be *individualistic* – displacing theft to competitors could have inadvertent benefits!

All the above purposes more or less *align* the bar management interests with the primary and secondary purposes, and desirability requirements, of *customers* identified above – simply because happy and safe-feeling customers buy drinks and return for more. To the extent that the police and health & safety officials can effectively apply pressure, bar management interests will also become aligned with societal ‘hygiene’ requirements of crime prevention/community safety. What is less clear is how *far* the bar management perceive this to be beneficial. This in turn depends on what they believe the customers, or the public officials, to perceive and to want; what they believe is the risk of choosing not to comply with the wishes or meet the needs of either party, and what is the minimum compliance needed to secure their own objectives. In this situation we must consider the possibility of compliance and alignment which is both *tokenistic* and *temporary*, i.e. suspended as soon as the pressure appears to be off.

Another more generic point to note is that, even with this apparently simple instance of crime prevention we seem to be getting into the realm of *complex adaptive systems*, where different agents, with diverse purposes, each perceive and adjust to changing states of the world they are in and to interdependence and interaction with each other. Intervention within such systems can lead to unforeseen outcomes, posing a particular challenge for designers to create security products which are capable of operating in a range of poorly-envisioned circumstances.

#### *Desirable requirements for bar management*

It’s somewhat more straightforward to identify the generic desirable requirements of Grippas for the bar management, which cover a mix of ‘in-function’ and ‘as-object’ issues:

- Economy of purchase
- Economy and ease of installation
- Durability
- Economy and ease of maintenance and replacement/removal with minimal damage
- Possible recyclability/transfer to new furniture (bars change their furniture, and sometimes style of furniture, every few years)

- Ease of cleaning
- No impediment to stacking of tables
- Aesthetics of product, alone and in combination with furniture, interior décor, brand identity
- Crime and safety-related requirements include:
- *Not* awakening customers’ perceptions of risk and feelings of anxiety about crime hence loss of trade
- *Not* presenting a negative image of the venue or company hence loss of trade
- *Not* conceding liability of bar in case of theft hence extra costs
- more?

#### *Purpose from manufacturing and marketing perspective*

Although DAC Research Centre is a non profit-making university-based institution, our interest is in designing crime preventive products which would be made, sold and used in the real world for a profit and a decent and durable return on investment. We therefore take the role of the ‘pseudo-commercial’ marketer and manufacturer ourselves. This is based on experience of *actual* licensing to industry of some of our products (including CaMden bike stand and Stop Thief chairs) and team members’ experience of being in/working with industry themselves.

#### *Primary and secondary purpose for manufacturers and marketers*

Manufacturers, wholesalers and retailers or shopfitting service providers all, obviously enough, wish to make their own *profit*, and must therefore align themselves with all the above purposes and requirements, especially demand from the bar companies who are their customers, and ultimately, by proxy, from drinkers in bars – the end users. Beyond basic profitability of marketing an individual product it’s possible in some circumstances that offering security along with other services and products may confer a *unique selling point* or *competitive edge*, or open up a *new direction* in which to expand operations or production.

#### *Desirable requirements for manufacturers and marketers*

Generic desirability requirements include:

- Ease and economy of manufacture including low cost of raw materials, reliability of their sourcing, production and durability of casting moulds, minimal waste, simplicity of production, fewest parts
- Low reject rate in manufacture
- Ease of packing/storage/transportation without



- damage or deterioration
- Ease of installation
- Widest possible market for fewest possible variants, to enable efficiencies/economies of scale, and durability of design in face of new décor and furniture to fit to – hence versatility of style and fitting is more important than being maximally adapted to very specific contexts
- Control of product liability issues e.g. through following international standards on product safety, nickel allergy etc; this being aligned with hygiene issues

There would appear to be no specifically crime-related requirements apart from those simply deriving from alignment with the wishes of bar management.

### Purpose – appeal to wider dutyholders

There is relatively limited profitability appeal to bar companies from investing in protection of customers through purchasing, installing and encouraging use of Grippas and pretty much any other security products or services. This means that, in mobilising the bar companies themselves to fit Grippas, some external pressure is needed to maintain their motivation. This could come from legislation for security and/or more immediate pressures from local police and licensing authorities in tackling a theft problem. Therefore it would be a sensible requirement to make the Grippa designs appeal to such people and organisations. Appeal could be supported by making the designs and their crime prevention rationale fully understandable, and aligned with principles that the dutyholders would support.

Other public or private dutyholders with an interest in user experiences, and area reputations and images, are those responsible for the *local economy and tourism*.

### Mechanisms and technicality – what the Grippa addresses, how it works and how it's made

We now shift perspective from purpose to the problem the Grippa addresses (nature and causes of bag theft), how it's intended to work (causal mechanisms of prevention) and how it's made (technicality). As said, the preventive mechanisms and their technical realisations are here described together for convenience and economy, but other arrangements could be adopted.

On the bag theft problem, its harmful consequences to various stakeholders have already been documented under purpose; the focus here is on, patterns of probability, the nature and unfolding of the events, and the causes that underlie them. On preventive mechanisms, recall

that these are broadly divided into causal processes which directly underlie the *intervention* (how the Grippa and associated communications materials, once deployed and used, influence and constrain offenders), and those which act indirectly, through *involvement*, specifically *mobilisation*, of other people and organisations to undertake crime prevention tasks and roles. Some of these tasks and roles amount to *implementing* the intervention proper – it is people such as bar managers who choose to install the Grippas, and bag-owners who may use them to constrain the thieves. On technicality, this relates to how the causal *properties* of the designed product or system, which contribute to mechanisms of intervention and involvement, are realised through *materials* and *structural features*, are *manufactured* and *operate* in service.

### The theft problem in bars – nature and causes

Here we summarise empirical findings and other knowledge on bag theft in bars. This is derived from three sources: an analysis, for this study, of police records of a sample of [xx] reported incidents over the period 200x-09 (ref); a wider review of bag theft problems and solutions by members of the team compiled as a Problem-Oriented Policing guide (ref); and practitioners' knowledge of criminals and their perpetrator techniques gleaned mainly from police crime prevention design advisors familiar with the problem. Our own practical experience in designing and trialling the Grippa clips also involved a certain amount of thinking, and play-acting, thief – user-centred design fashion [?true?] – which gave some additional insight.

We start with the basic nature and patterns of the bag theft problem, then move to coverage of perpetrator techniques and scripts, to script clashes between thieves and bag-owners, and finally to wider consideration of the situational factors conducive to theft, that the techniques and scripts have (co-)evolved to exploit and to cope with. A fuller analysis would go on to explore the wider *opportunity structure* (ref) of bag theft in bars (covering for example the factors that make for availability of bags full of rich pickings, inattentive owners in crowded places and so forth). From the point of view of the Grippa designers, focusing on the immediate circumstances of theft, this is a backdrop they simply have to live with. However, it becomes important when contemplating marketing issues for eventual production models of Grippa (how many bars are high-risk, and in what kinds and clusters of location?), and any future *changes* in the structure (e.g. will counter-terrorism pressures cause good quality CCTV to be installed in most city centre bars?).

### *The pattern of theft of bags in bars*

[basic pattern stuff from Bag theft POP plus Kate&Aiden stats analysis]

### *Perpetrator techniques and scripts*

Theft, recall, is about illegal possession and the stealthy transfer from owner to thief by which this is accomplished. In the case of theft of bags from people seated at tables in bars and similar venues, the bag and/or its contents are the loot, and the transfer is accomplished by various *perpetrator techniques*. The sequence of tasks that the offender has to successfully accomplish in the course of applying the technique, is the *script*. Various additional *resources*, such as tools or skills, may be deployed. For the purposes of this project, knowledge of these techniques was obtained mainly by interviews with police officers and reading of other research; crime reports rarely contained sufficient detail and in this instance there was no provision to interview offenders direct.

The techniques that we are aware of centre on stealthily removing either the bag or its contents. The thief may sidle up to the table where the victim is seated, and surreptitiously slide or hook the bag, often with their foot. The bag is moved till it is out of the view of the owner, or at least so it is now in a position where the owner will pay no attention if the thief reaches down and picks it up, believing it is someone else's. [other techniques?] The thief must also avoid attracting the attention of other people in the bar, whether customers or staff, who might detect what they are up to and take some action such as warning the target customer or challenging the thief.

As part of the wider script the thief obviously has to select a likely bar; enter the bar and do a quick assessment whether this is a good or a bad venue for theft; if good, blend in with the customers so as not to attract attention (which may be further complicated by having to find ways of plausibly avoiding buying drinks every time they enter a bar for professional reasons); scan for a likely bag/customer/conjunction, approach, displace bag, pick up bag, carry off bag to toilets where it is plundered and dumped; or directly leave the pub with bag and/or its contents – all this preferably undetected until a safe period of time has passed.

### *Bag-owners' scripts*

Bag-owners will also have scripts, which may or may not have an explicit crime prevention aspect. Our knowledge of these derived from our own experience as customers in

bars, plus informal observation of others. The basic script is about finding a convenient/pleasant bar; entering and scanning for attractiveness of venue and/or customers, and for space to sit; deciding to stay; perhaps locating a table and 'reserving' it with clothing or even the bag whilst buying a drink; sitting down, perhaps in company; occasionally leaving the seat (buying drink, visiting toilets) and eventually leaving, hopefully with bag and contents. The bag owner is likely to consider bag security at some time, whether in selecting a table/seat or in placement of bag. The detailed placement of the bag may be at the owner's feet, on their lap, on the table or on the side or back of the chair. In both table selection and bag placement security is just one among many considerations, and constraints of physical configuration and crowding etc may limit choices.

### *Script clashes*

Script clashes between thief and bag-owner in this situation include:

- Surveillance v stealth during approach of thief, taking of bag and leaving bar
- Challenge at the point of theft ('Hey, what are you doing with my bag?') v plausible excuse ('Sorry mate, it just caught on my foot – not much room here with all these people.')
- Pursuit v escape once the intention and/or the act of theft has been detected

### *Immediate causal factors conducive to theft*

Various immediate causal factors contribute to the *Conjunction of Criminal Opportunity* for this kind of theft, and tilt the balance of the script clashes in the thief's favour.

### *On the offender side,*

- The *thieves* will of course be *predisposed to offend* and *ready* to do so either in advance, or by prompting from tempting views of vulnerably-placed bags.
- They will have plenty of bars within easy reach of their *presence* either on foot or by private/public transport (otherwise the bars will have no legitimate custom).
- Offenders will have various *resources*, especially *perpetrator techniques* and scripts and also some courage. Other emotional resources might serve to maintain an inward and outward professional cool. Still other resources and techniques may include dressing to blend into the clientele of the facility (e.g.

city banker types), so avoiding exciting suspicion. (It is possible that offenders may work in pairs or small groups, which has not specifically been taken into account in the analysis of the techniques and dynamics of offending.)

- Offenders' *perception of opportunity* of course relates to of risk of harmful events (arrest, embarrassment, beating up), effort/cost (emerging empty-handed, wasting time/opportunity cost) and reward (rich pickings from bags).

Several *situational* factors tilt the balance of the script clashes in the thief's favour.

- The *target property* which the Grippa is intended to secure is of course the *bag/s* of the customer. The bag is usually just the container for the ultimate target – cash, phones, keys, laptops and other personal hot products which are attractive to thieves – though in most cases thieves take the entire bag (after all, it is designed for carrying purposes whatever the rights of possession of the current holder), and pick over the contents when they have reached a safe place.
- The *target persons* are the bag-owners. These are usually unable, or unwilling, to perform the task of protecting their property well, to the extent that in many cases they will be acting more as crime promoters than preventers (we could at least consider them 'diminished preventers'). The owner either a) leaves their own bag in a place where they physically cannot guard it by sight or touch (e.g. under the table, hanging on the back of their chair), or b) if guardianship is technically possible, have their surveillance capacity diminished by distraction from conversing with friends, watching sport on TV, participating in pub quizzes; or by generally losing vigilance due to fatigue, cognitive overload of noise, music etc, and alcohol. They may well be uninformed about the degree of risk – and not empowered to recognise criminal attempts, e.g. unaware of perpetrator techniques such as hooking. They may find challenging a potential offender in ambiguous circumstances embarrassing. They may be tourists with limited command of English and hence may be considered relatively ineffectual at detecting and/or responding to crime when it happens.
- Third-party customers and bar staff might also act as preventers, looking out for, and responding to, the theft of someone else's bag. But (with some exceptions) they are constrained and incapacitated in similar ways to the target customers. To the extent that the facility benefits from social cohesion (e.g. a 'local'

pub where regular customers know one another and might be expected to undertake collective protection) there will be some motivation to intervene, whether before the event (pointing out an insecure bag), during (shouting a warning, supporting a challenge) or after (giving chase).

- The *enclosure* often has many criminogenic properties, often functional ones from the offender's perspective (note the '-ables and -ibles'):
- It is publicly accessible, giving offenders easy entry, whether as planned crime sweeps or casual visits where crime opportunities sometimes present themselves.
- Conditions are often unfavourable to surveillance by any party who might act as preventer – owner, other customer or bar staff: it may at times be obscured by crowding or barriers and unevenly lit. Crowding supports the plausible excuses already described.
- Crowding may diminish the owner's scope to challenge invasions of space because people are forced to stand close to tables.
- Keeping track of who is coming and going, and what their intentions may be, is often difficult. The enclosure may be *enterable* and *leavable* by multiple street doors, without any access control, hence escape may be easy. An analysis of seating positions hardest hit by bag theft in one bar (ref) showed that these were along the interior path from one street door to the other, and not concentrated (as [?]customers/police interviewed had predicted), right beside each door ready for a quick entry, grabbing of bag, and equally quick exit). In some cases the bar tables may be outside – either in an outdoor enclosure or on the street in the *wider environment*.
- From a practical implementation perspective, it is not possible to economise by targeting only high-risk *tables* for installation of Grippas, deterring thieves from just the most favourable locations to attack, because bar furniture is often moved around (e.g. to accommodate dancing at times), and the Grippa-fitted tables could find themselves next deployed in a low-risk *position*, leaving the high-risk positions deprived of protection.
- Although the [N] Wetherspoon bars whose crime statistics were analysed did not constitute a truly random sample of their London venues [why?], they did demonstrate the classic 'J-curve' distribution of 'risky facilities' (ref) which showed a small number of the bars accounting for a large proportion of the total crime. Overall, the 'rich pickings' contents of the enclosure and any deficient security levels may

cause any one bar to become a 'crime attractor', a location which offenders actively seek out because of the opportunity it provides in terms of limited risk of harm, limited effort and good reward. Even if this is not especially the case, the routine presence of many people passing through a busy facility for mainly non-criminal purposes may act as a 'crime generator' due to the casual conjunctions of opportunity it brings about.

### Grippa: security function

Having described the nature and causes of bag theft, we now set out the security function of the Grippa clip that is intended to prevent it. We first cover the basic function – how it's intended to work – in terms of both direct intervention mechanisms, and how bag owners and others are mobilised to use it or otherwise support its use. Then we move on successively to minimising any criminal harms that emanate from Grippa itself; the supportive security functions that protect and extend the basic one; meeting hygiene requirements; and meeting the purposes and requirements of bar owners. The primary focus is on mechanisms of prevention as they interrupt, weaken or divert mechanisms of crime causation, but where relevant the technical considerations and solutions of the design are brought in. [\*\*\*\*add any other technical consid/solutions that I have missed folks – materials, structure, manufacture, finish, operation. Also, I think we cd have a generic technical section at the end to sweep up any tech issues of interest that have been missed.]

#### Basic security function

The Grippa clip is intended to work by preventing removal of the bag – by *anchoring* it through the bag handle/s to a table that, through weight and bulk, is itself difficult to remove or cut. The design requirements for this are simple and obvious. But consideration of the detailed mechanisms reveals greater complexity, and – a common characteristic of preventive methods (Tilley CCTV; Ekblom 2002, 2005) – parallel possibilities.

The Grippa is intended especially to make *stealthy* removal difficult and/or dangerous to the offender, by:

- Requiring hand movements which are visible to owner and to other people, and which are unambiguous in revealing their intent to release and remove the bag. The thief's attempt to disarm the accusation with an excuse is itself disarmed.
- Requiring those movements to be made close in

to the owner, which in turn violates the owner's personal space, making it psychologically uncomfortable for the thief, and more likely the owner will spot and be sure enough of what is happening to feel comfortable challenging the move.

These are *real-time* preventive mechanisms, albeit dependent on *advance installation and use* of the Grippa. But as so far described they are only part of the story, because they have to work *differentially*, i.e. discriminating between thief and legitimate owner in terms of their scripts and requirements. (Simply blocking the removal of the bag directly would render the Grippa unusable by the owner.) Such discrimination has to rely on some kind of *difference* between owners/customers and thieves. It operates in two ways:

- Making it physically difficult for the thief to release the bag from anchorage whilst physically easy for the owner to both secure and release it.
- Making movement, and intention of movement, obvious to all onlookers – which is dangerous for the thief but of no consequence for the owner.

Both are realised through a simple difference in *position* relative to the anchor release-action of the Grippa. The Grippa design and its installation are together arranged such that the bag-owner is occupying the only position from which successful release can be easily achieved. How far this discrimination can be reduced by the thief acquiring skills or developing tools is so far unclear.

Additionally, as well as being secure in *real-time* terms, the Grippa has to send *deterrent or discouraging messages* to the thieves in advance of the attempt. These have the advantage that the criminal attempt does not proceed as far as the stage of potential damage and confrontation. They may work at different stages of the thief's script in seeking and entering bars, on entry deciding to abort or stay, seeking likely tables/targets, and moving in on the one selected. Grippa may thus deter or discourage:

- By its presence alone, indicating that the bar as a whole may be a security-conscious venue. This may deter and discourage the thief from entry whilst attracting (or at least having no influence on) the legitimate customer. This may simply be achieved by the salient visibility of the Grippa, the configuration, and the wider security system centred on the bag-owner. However, deliberate *semiotic* mechanisms can be important here (Whitehead et al. phones ref). The Grippa has to *look* physically robust in its grasp and

its anchorage, and to be difficult to release bags from, at angles other than those available to the owner. It must also appear to be obviously within the owner's personal space and visual field. The bar as a whole must look like staff are paying attention to who is coming in and out.

- *Adjunct communications*, such as on posters, can supplement this discouraging and deterring message to thieves. Simultaneously, they can gain attention, acceptance and trust of customers whilst reassuring and mobilising them (see below).

In *technical* terms, various prototype clips were developed to realise both the basic anchorage to the table/support of the bag, and the first two of these discriminatory mechanisms. In all cases, obviously, the clip had to be fixed to the table. The material had to be strong enough for a fairly compact clip, and any individual parts, to take the load of a heavy bag. Metal was therefore used rather than the plastic of the Chelsea clip. [other advantages of metal set against greater cost somewhere – robust looking, aesthetics, durability]

Basically two physical configurations for discrimination were created. Here we have to consider the immediate *operation* of the clip. One used a simple, one-piece 'convoluted path' that the owner had to thread the bag through to get it on and off the clip. The other was a hinged gate which was easily pushed into the interior space of the clip by the bag handle, then the handle having passed beyond it, fell back to the closed position, where it was held by a spring or gravity against the body of the clip (gravity was preferred due to fewer components to manufacture/assemble, greater durability and less cost). Together, the gate and static part of the clip formed a closed loop). To release the bag the gate was manually lifted whilst the bag handle was manoeuvred out. In both cases the release of the bag handle was intended to be easier to accomplish when close to the clip and sitting or standing in the legitimate owner's position; and harder to do so stealthily, or at all, when attempted from any other position. [diagrams/pics]

#### *Minimising criminal harm from Grippa itself (1) – avoiding inadvertent increased risk of bag/contents theft*

It is not impossible that well-meaning crime prevention designs can unintentionally *increase* the risk of the very crime they are intended to prevent. This could happen with the Grippa, for example, if it held the bag in an upright position where it was easier for the thief to scan the bar for likely targets, and also to 'dip' the bag's contents.

(Placing bags in a more standard configuration rather than willy-nilly on the floor or the bag-owner's lap could facilitate the development of a particular script and even tools such as hooked wires.) Risk could also be increased if the Grippa were fixed at the bar counter itself, for the benefit of standing customers. There, it would be easy for a thief to stand close alongside the owner and their bag, whose opening was now conveniently at hand height. No particular design solutions to these risks were identified, and indeed with appropriate installation the risks were not considered high.[ok?]

At another level, if the Grippas in a bar seem to be ignored and unused, and communications lie discarded on the floor, this could encourage thieves by indicating that neither customers nor bar staff believe in the value of the Grippas, care greatly about security, or believe that 'natural' security is adequate.

#### *The mobilisation dimension – working with the bag owner as crime preventer*

The diverse *motivation* for the mobilisation of bag-owning customers, bar management and manufacturers/marketers has already been covered by listing their purposes and requirements for design. The focus of mobilisation in this section is on how, through design, it alerts, informs, motivates, empowers and directs the agents *immediately* involved in the crime situation as potential preventers and promoters. This is very important because Grippa is not an 'install and forget' kind of design, like the immobiliser in cars.

For the above preventive mechanisms to work successfully, they almost all require the bag owner to use the Grippa, and to use it properly. (The exception is deterrence of the thief through mere *perception* that the bar is security-oriented.) The owner is therefore a necessary functioning element of a security system; mobilising the owner to assume that function is a vital action in which design plays an important part.

More broadly viewed, the bag-owners' tasks that Grippas are intended to mobilise include the following:

- Possibly seeking/choosing bar fitted with Grippas
- Seeking table/seat with free Grippa
- Deciding to fix bag to Grippa
- Fixing bag to Grippa/arranging bag so it is out of way and unlikely to spill contents/ gape/ trail on floor
- Possibly arranging body to limit angles of approach available to thieves and facilitate surveillance



- (f) Surveillance of bag and any approaches to it
- (g) Response if required (protectively grasp bag/challenge possible thief)
- (h) Remembering/deciding to release and take bag on temporary departure (e.g. to bar, toilet, outdoor smoke – possible conflict with convenience and with desire to mark possession of seat) and permanent departure
- (i) Releasing bag and not forgetting to take it on permanent departure

The process of mobilisation, as Part 1 described, can be characterised by the CLAIMED framework. Once the preventive tasks or roles are Clarified, and appropriate people Located to take them on, those preventers (here, the bar customers/bag-owners) have to be Alerted, Informed, Motivated, Empowered and Directed to use the clip. Likewise, the bar staff to *support* the use of the clip by the bag-owners. Prevention tasks may also be undertaken by other customers, bar staff and the installers of the Grippas.

The Grippa design must support these tasks, alerting, informing, motivating, empowering and directing the owner as necessary for each one individually and for undertaking the entire purposeful script. As a corollary, it must not lull, confuse, deter/discourage, inhibit or misdirect the owner. Each of the above tasks has a failure mode which may be influenced by other designable properties of the Grippa and/or of the context.

#### Alerting and Informing the bag-owner

- Our observations and interviews concerning the lack of use by bar customers of the Chelsea clip, strongly suggested that a major mobilisation requirement was simply that the Grippa clips be *visible* from sitting or standing positions. (Chelsea clips tend to be placed several cm in from the table edge, not only rendering them invisible but subjecting the bag-owner's fumbling hands to possible encounters with deposits of chewing gum.) [is this underhang a necessary part of the Chelsea design or is it simply that they do not force the installer to put them on the edge?] They were therefore designed, where the position of table legs allowed, to be installed at the very edge of the table. (One prototype design, the Poppy, was different – this catered for tables with a single central leg, where the means of fixing and avoidance of tipping were important issues. The final design clamped round the central leg and like a flower on a stalk, with four clips projecting radially like petals.) An alternative high-

visibility position considered was on the table top, but this was rejected as interfering with desirability requirements of bar management, including stacking, cleaning, not irreversibly affecting the appearance of the table-top, and avoiding spilling drinks. [pics]

- The *colour* of the clip was also considered, in an issue we called '*blend or bling*' – in other words, should the clip aim to match completely the style of the bar furnishings (e.g. brass in a traditional environment), or should it be coloured to deliberately stand out (e.g. coating with fire-engine red, which also connoted risk.)? In the end, both variants were produced, which would facilitate attunement to market preferences. [pics]
- Given the importance of the 'awareness' issue we considered it necessary to supplement the clip's own elementary self-alerting property with *communications products*, including wall posters and bag-shaped cardboard hangers containing 'use me' messages to fit on the clips. [pic]

#### Motivating the bag-owner

- The main motivator was intended to be the bag-owner's concern to protect their own property. A robust *appearance* for the Grippa was considered necessary beyond what was adequate for a robust *performance* and technically, this was achieved by [? Chris, Marcus – stout looking hinges, well-fitting gates?]
- To some degree we attempted to make the Grippas a physical pleasure, even fun, to play with.
- Much design effort was devoted to minimising any inherent disincentives to bag owners to use the Grippa, such as awkwardness to use, as listed under Purpose/desirability requirements above. One particular concern was not to make it look too gendered – i.e. indicating a feminine or masculine kind of thing to use. Another issue raised by some customers interviewed was that of forgetting one's bag on leaving the bar. Whether this risk would be made more likely by hanging bags on the Grippa rather than leaving them on the floor is only testable in the field and under different conditions of crowding etc. (However, in the final analysis this was a matter of the bag-owner's perception rather than what the designer knew to be true.) But requiring the owner to take a positive action to secure the bag, then having it raised up in view and in many cases pressed against their leg, were felt to be more conducive to remembering than forgetting. [?report on the rating scores of the Grippas and Chelseas compared – Aiden's latest doc]



## Empowering the bag owner

- The clip in its entirety was intended to empower the bag owner to guard and retain their property. The idea was to work *with* the bag owner and their existing security practices rather than to entirely supplant these and make the whole security system totally product-dependent. This issue is returned to below (under 'mis-mobilisation').
- The clip was designed to be *as self-evident in purpose and utilisation* as possible; and enabling it to be mounted side-on was thought to better reveal its workings without reduction in its direct preventive function. Nonetheless, for versatility, all models were designed to fit either pointing sideways or outward from the table corner.
- Self-evidentiality was however supplemented by use of the card hangers, as described, in the shape of a bag hanging from the clip. Unfortunately these were so often dropped by customers on the floor that the bar staff ceased to deploy them. The final design of the clip was therefore given the option of a raised 'hanging bag' outline on the body of the clip itself. [pic]

## Directing the bag-owner

There was no intention to forcibly direct the bag-owner to use the Grippa, or to use it in a specific way, beyond the simple constraints of its securing action (the bag-owner simply had to use the gate or convoluted track in the way intended, no alternative action was possible).

### *Minimising criminal harm from Grippa itself (2) – avoiding mis-mobilisation of bag-owner*

Some of the bag-owners observed and interviewed were highly alert to the risk of bag theft, and consequently held their bag on their lap or hugged it to their body. In the team's opinion this offered a better security solution to those individuals than did the Grippa. Therefore, we were careful not to make the messages in the posters too directive [what were they?].

### *Mobilising other customers*

Although they may not have such a good view as the bag owner, and may or may not be motivated to attend and respond, the unpredictability and the 'observation from many angles at once' considerations may influence the offender's decision to steal. As said, this mechanism is more likely motivated and empowered in a context of

social cohesion such as a bar with 'regulars'.

### *Mobilising bar staff and management*

Bar staff in particular may or may not have the incentives to protect the property of their customers – this will depend on the policy, supervisory practices and reward structure operated by management at all levels. They may otherwise simply not have the time or attention space. They may or may not be alerted and informed about, or empowered to tackle the bag theft problem – its extent, nature and how to respond. This may be exacerbated by poor English, and a rapid rate of turnover that allows individuals little time to familiarise with the layout, or to be specifically briefed about bag theft and bag security. Ideally the Grippa clips, in the right managerial context, might serve as a focus for bar staff to undertake surveillance and to give preventive advice to customers, including pointing out the theft risk and indicating the presence and use of the Grippas themselves. In terms of being designed to motivate *company management*, apart from avoidance of undesirable properties, little that is positive can be achieved by design of the Grippas. One exception was ensuring that the Grippas could be re-used (both in terms of versatility of fitting and style, durability, and ease of removal and re-installation), which also had a sustainability benefit. Again, though, it's conceivable that in the right *climate* set by police, politicians, media and so forth, the Grippa can act as a focus for management to take an active interest in the security of their customers and to help alleviate a national crime problem.

### *Mobilising the installer*

In the commercial context of the bar, one assumes that alerting, informing and motivation are not issues for the installer, who is likely to be working at the bidding of the bar management. Empowerment and direction remain relevant. In the Grippa trials, all clips were installed by our own team members, working with drills and screwdrivers alone, so we have no direct experience of the task of guiding and directing other installers. But accurate positioning relative to the inside/underside corner where the table leg met the table top was easy, and in theory easily-communicated. As said, selection of specifically-located tables to receive clips was not undertaken because tables regularly moved around.

### Grippa – supportive security functions

In Part 1 it was pointed out that we have to think of security products in two ways: *as-object* as well as *in-function*. The

latter covers possible events where the product is doing what it was designed to do – protect some other person or entity – and designers are concerned to protect against some inherent failure of that function, for example due to the bag jamming in the clip or the offender somehow disabling it. The former covers possible events where something entirely *incidental* to its security function (such as accident, wear and tear, and criminal misdeeds such as theft of the product for scrap metal) causes that function to be lost; other consequences to be incurred (such as the repair or replacement and reinstallation cost of the security product); and even other crimes to be facilitated (such as misuse for hanging a bomb in a bag). We cover these dimensions in turn.

*Grippa as-object – basic self-protection against accidental damage and wear; against incidental criminal misdeeds involving the product itself as target or contributor*

No specific design responses were made for these purposes. [correct? Any decisions on coating?]

With *accidental damage* (which could include accidental wrenching off from the underside of the table) the Grippa's robustness in supporting heavy laptop bags or similar was assumed to give sufficient protection. [what about crushing through stacking? Spoiling the surface of the Grippa through inappropriate cleaning materials?]

With criminal misdeeds targeting the Grippa for *misappropriation* (e.g. theft of materials) or *mistreatment* (e.g. scratching, jamming or bending out of shape), its location in a protected environment was thought to make this unlikely. (With Grippas fitted to outdoor tables, brass versions could conceivably be at greater risk from theft, so screws requiring specialist tools to unscrew them might be worth considering.)

Likewise, another crime that the Grippa might facilitate could be terrorism, where (as said) a bag containing a bomb could be left hitched to the clip. This possibility of misuse was again judged unlikely and the extra facilitation of the crime was felt to be little or none – after all, it would be easy enough to leave a bag on the floor in the absence of Grippas, and probably no more or less likely to attract attention from the security-minded.

Risks of *misbehaviour* might just about be envisaged in bars with younger clientele – for example stag-party pranks involving tying people's belts or shoelaces to the Grippa – but these possibilities would, we judge, be neither more likely nor more harmful than alternative misdeeds in the

absence of the Grippas.

*Grippa in-function – self-protection against unintentional damage in intended use*

Such damage could happen for example through overload from a very heavy bag, or in forcing open the clip to take wider bag handles than it had been designed for. Robust construction of the body and, where appropriate, the gate and hinge of the clip is the obvious remedy, though this has to be traded off against economy and sustainability in terms of cost and use of materials. [technically, achieved by...?]

*Grippa in-function – advanced self/other-protection against criminal countermeasures aimed at disabling or bypassing the Grippa's security function*

Countermeasures *disabling* the Grippa seemed unlikely. The intrinsically simple construction and operation of the Grippa leaves little scope for disabling. This would involve cutting, bending or jamming them open, actions unlikely in the protected enclosure of the bar, and indeed likely to be more obvious than moves to release the bags themselves. And where such disabling was done in advance of customer use rather than in the immediate course of theft, the bag owners would surely be unable or unwilling to hitch their bag handles to the clips in the first place. *Failure of, or tampering with, the security function* would be fairly obvious to the bag owner if it ever happened. This would mean at the very worst, the loss of protective capability rather than the more serious risk of customers trusting their bags to something which *looked* secure, but was in fact not. Incorporation of special *tamper-evident* properties was therefore not considered necessary.

A tactical-displacement shift from removing the entire bag to *dipping its contents in situ* might be possible, depending on whether the bag was of the open or closed type, and whether the hanging position facilitated entry e.g. by bracing the mouth of the bag against hand movements so that fingers could slide in more easily. These actions would theoretically be possible but would require thieves to undertake a great deal of close-in searching and scanning activity to identify suitable bags in suitable positions. Relative to the rather straightforward perpetrator technique of simply hooking or sliding the loose bag along the floor, this alternative method would very likely reduce the reward rate and increase the risk that the thieves are spotted.

Countermoves *attacking other parts of the secure system* might be more likely. *Cutting bag handles* might be contemplated, but offenders would have to go equipped with a sharp blade, which carries various legal risks. They would have to find some means of cutting stealthily, close to the bag owner's legs and lap, which would be just as intrusive as unhitching the handle. They would also have to have a hand available to catch the bag in case it dropped or slumped to the floor. The chances of doing this without radiating suspicious sights and sounds seem minimal, and the possibility of development of skills and tools to cut the large variety of bag handles, which are mostly designed to be tough, are limited. Gardening secateurs would be concealable and might possibly work, but if spotted and challenged there would be no possible excuse with which thieves could respond.

Countermoves could also *attempt to obscure or distract surveillance* by trailing clothing over the table, or even spreading a map on the table when asking for directions. This could also serve to *acquire permission to enter personal space*. Other means of distraction might be employed, especially if a co-offender is involved. Counter-countermoves to these might include using sound – making the Grippa emit a noise such as a mechanical squeak or click when the bag is being released – though this is unlikely to work well in a noisy bar.

At a more strategic level, if there were significant possibilities of *displacement to other forms of theft within bars and similar facilities*, there would be little point in bars investing in Grippas to close off this particular opportunity alone. To a large extent this possibility could only be tested by field trials. But it's worth noting that pickpocketing techniques are probably more demanding than bag-sliding and -hooking, where there is no personal contact – so switching theft methods from the latter to the former is 'uphill' in terms of skill transfer. *Displacement to other bars unprotected by Grippas or equivalent* might be thought 'not Grippa's problem'. But design and marketing can have a role even here, because designs with a broader appeal to different contexts and purchasers may well have achieved greater coverage of bars within displacement distance.

### Grippa – meeting hygiene requirements

Basic health & safety-type hygiene requirements addressed included, technically speaking, avoiding allergenic materials such as nickel, rough finish and risk of pinching or trapping fingers in the mechanism. The Grippas were arranged with the manufacturers to meet [British Standard

...], which [does what]. Damage to the Grippas from accident, wear or criminal intent could conceivably leave projecting ends, maybe even sharp ones if the metal fractured. This was considered no more risky than any other accident to furnishings such as screens, coat-hooks etc, so *fail-safe* modes were not explicitly designed in.

### Grippa – meeting bar management purposes and requirements

As-object requirements already listed included safety, the cleanability and stackability of tables, and matching with décor and brand identity, and not irreversibly damaging visible surfaces on installation. Designing the Grippas to fit snugly beneath tables rather than awkwardly on top of them helped in most cases; safety was covered immediately above under hygiene.

In-function requirements were more challenging, since potential negatives of crime prevention for bar owners were finely balanced with positives. Solutions were as follows:

- Technically, installation/anchorage to the table was by just two screws, minimising damage to the table and making the fitting reversible.
- Placement and orientation beneath the tables were, as said under mobilisation, easily communicable to fitters, requiring no detailed instructions, although guidance on principles would be needed to cope with the widest range of furniture styles and construction. Technically, drilling and fitting was a quick and relatively undemanding task well within the capability of the kinds of carpenter or maintenance staff normally employed/contracted by bar companies. Each clip took no more than [2] minutes to affix, with up to four per table.
- What the Grippa and any adjunct media (such as hanging cards and posters) communicated to bar customers was understandably of some concern to bar management. Too prominent an emphasis on crime risk and the need to guard one's valuables was felt to be likely to deter custom, although the balance of concern (and the balance of pressure from the police) could shift in bars which were especially heavily-targeted by thieves. One approach was to emphasise the 'tidiness and safety' benefits of securing bags where other customers and staff would not trip on them or accidentally damage them. The message developed for posters was therefore a low-key one, namely [add messages].

## Technicalities – general issues

[Shd there be a generic section on tech issues – materials, structure, manufacture, finish, operation.? Not to report technicality for its own sake, but a) to learn specific lessons on DAC issues, and b) to illustrate to crime scientists/situational crime preventers etc that doing DAC is actually a demanding affair.]

## Summary four-way description of Grippa clip

In Part 1 we presented a brief summary four-level description of the Stop Thief chair. Based on the exposition in Part 2 as a whole, an equivalent summary rationale for Grippa is as follows.

**1 (security niche)** The Grippa is a fitted security product, **2 (purpose)** designed to reduce the risk of *theft of customers' bags* in places like *bars and restaurants*, **3 (mechanism)** by physical *anchorage* of the target bag differentially easier to release by the bag-owner, by mobilising *usage of the product*, and the *surveillance and reaction* that it favours by the user/owner and others acting as preventers; and by *deterrence* through increasing the offender's perception of risk of being detected and caught in the act. This is achieved **4 (technically)** by the installation of a strong metal clip – the Grippa – on the underside edge of the table next to the leg, whose position, orientation and operating action enable the bag-owner to hitch and unhitch bags of a range of sizes, shapes and weights to the table whilst remaining close to their body and within their visual field; and which exposes it to view. The Grippa is fixed to the table by screws, and operates (in the case of the spiral configuration) by requiring the bag handles to be threaded through an open gap, or (with the loop) by pushing the handles against a hinged gate which slips open to admit the handles and falls back under gravity to close the loop and retain them. Release with the spiral is a matter of back-tracking the hitching action; with the loop, the bag-owner has to lift the hinged gate whilst sliding the handles off the fixed part and out of the now-open gap of the loop. In both cases the Grippa and its positioning is such as to make operation *differentially* easy for the bag-owner seated or standing at the side of the table where the bag is hitched, and *difficult and with obvious movement and intent* from other positions. The mobilisation of the bag-owner is attempted by the highly visible position, bright colour, simple, convenient operation and indicator of function in the shape of an embossed hanging bag symbol.

## Concluding remarks [other ideas for here?]

It's interesting to compare the above summary rationale with the earlier one of the Stop Thief chair. Although there are considerable differences in technical realisation, and linked differences too in niche and purpose, the underlying similarity of security function (purpose and mechanism) between such physically different products is quite striking.

The summary is compact and reasonably self-explanatory, but in knowledge management/transfer terms it is only adequate for basic search and retrieval by designers and operational users such as crime prevention practitioners or security staff. It does leave out a lot of detail, and the research, analysis, reasoning and tradeoffs behind the final design. So in that sense it is not adequate for building more than a minimum of innovative capacity.

As the Grippa case study has demonstrated, there is far more that can be extracted and articulated from a systematic, in-depth account of the security function of a given product or system to help build that innovative capacity, ranging from the highly-specific to the generic. It could:

- Give *would-be clip-designers* the capacity to 'get smart quick' on their own designs, created to match their own, differing, contexts; likewise for theft preventers in general.
- Give the *designers of security products* in general a model and examples for undertaking design.
- In conjunction with the framework set out in Part 1, give a more generalised transfer of knowledge on how to research, think about and undertake the design of products, in the widest sense, with a security function. This could take the form of guidance for professionally mature designers, or educational material for design students.

The conceptual framework for supporting these applications is, arguably, on its way to being fit for purpose. The remaining challenge in all cases is to find formats, and media, that can transfer this knowledge in an efficient and appealing way, that structures, focuses and supports the vital design freedom rather than choking it. The quantity and complexity of the content is such as to pose a considerable obstacle both in terms of how many designers think, and the time and effort they are willing, or can afford, to put into acquiring the necessary knowledge and competence.

One response is to develop a 'sliding scale' of materials:

simple, perhaps heuristic, guidance at one extreme, leading progressively to subtle, sophisticated approaches at the other, aimed at designers who specialise in security – especially, but not exclusively, the rapidly-evolving *high end* of security as in cyberspace. But there is no escaping the fact, confirmed within this case study, that *it's no simple matter to do design against crime, in a way that fits in with all the multiple drivers in the commercial market and public policy, copes with diverse and changing contexts and what amounts not just to adaptive criminals but to entire complex adaptive systems.*

The above discussion assumes a world in which knowledge accumulates and designers learn from one another to build up a discipline based on domain content as much as one founded on pure creative capacity and the generic design process alone. However, some may claim that genius-level, insightful designers could, and should, be able to produce the necessary goods with minimal assistance. This is debatable, especially in terms of needing a valid base of evidence and theory, and valid and reliable methods of obtaining and interpreting evidence, including by new research. And the trouble with genius is that it's by definition in short supply. The theoretical demand for innovative capacity in design against crime is vast. Consider all those millions of products, systems, places, services and so forth being invented, designed, manufactured and deployed, all with some potential to be misappropriated, mistreated, mishandled, misused and misbehaved with, and conventional approaches to crime through 'cops, courts and corrections' being of limited capacity and great expense. In many cases this risk in principle reducible by design. We may need geniuses to inspire and lead the design against crime field, but we also need to scale up by mobilising the everyday cadre of jobbing designers to routinely and effectively fit crime within their working practice.

But designers, and the design space they navigate and create within, cannot be the sole focus of action to increase the amount and quality of design against crime work that is undertaken. The report commissioned by the Home Office and Design Council on the state of design against crime at the end of the last millennium (ref 2000; Learmount 2005) identified a wide range of enablers and constraints that needed to be addressed (and see also Clarke and Newman mod crim prods, and Armitage and Pease MARC) in the career structure and organisational reward of designers; and among manufacturers and marketers who act as design decisionmakers, consumers, diverse government departments and national/international bodies who set the climate and the terms

of competition. These issues are currently exercising the Home Office's Design and Technology Alliance against crime (ref?).

### Implications for interdisciplinarity of crime science and design

Crime science has plenty of theory, preventive principles and generic practical methods for guiding preventive interventions based on understanding of the crime problem and causes (although classic situational crime prevention can be improved, as argued here), and employing rigorous social research procedures. But *in itself* it doesn't have the capacity to convert these principles and generic methods into a reality that is practical, durable and appealing, and adapted to context in a way that resolves complex tradeoffs and serves multiple drivers well beyond the crime, security and community safety domain. Design of course does, and potentially in a highly generative and adaptive way that is vital for handling changing social and technological contexts and new targets or evolving perpetrator techniques; not to mention the ability to apply the 'design way of thinking' which challenges assumptions about the nature of 'the problem' as initially put by dutyholders and stakeholders to the designers. But design as a process in *itself* lacks the necessary domain knowledge possessed by crime science, and a good part of the relevant research and evaluation methodology. Together, as an interdisciplinary whole, they have the potential to significantly address the problem of crime whilst making minimal adverse impact on the activities and other values and needs of everyday life. It is hoped that the framework and the case study have demonstrated this interdisciplinarity and its potential, and have set the scene for further progress in this field.