

Edith Cowan University  
**Research Online**

---

Australian Security and Intelligence Conference      Conferences, Symposia and Campus Events

---

12-4-2013

## Breaking the Theft-Chain-Cycle: Property Marking as a Defensive Tool

William J. Bailey

*Edith Cowan University*, [b.bailey@ecu.edu.au](mailto:b.bailey@ecu.edu.au)

David J. Brooks

*Edith Cowan University*, [d.brooks@ecu.edu.au](mailto:d.brooks@ecu.edu.au)

Follow this and additional works at: <https://ro.ecu.edu.au/asi>

 Part of the [Computer Sciences Commons](#)

---

### Recommended Citation

Bailey, W. J., & Brooks, D. J. (2013). Breaking the Theft-Chain-Cycle: Property Marking as a Defensive Tool.  
DOI: <https://doi.org/10.4225/75/57a03aadac5d0>

DOI: [10.4225/75/57a03aadac5d0](https://doi.org/10.4225/75/57a03aadac5d0)

6th Australian Security and Intelligence Conference, Edith Cowan University, Perth, Western Australia, 2nd-4th December, 2013

This Conference Proceeding is posted at Research Online.

<https://ro.ecu.edu.au/asi/27>

# BREAKING THE THEFT-CHAIN-CYCLE: PROPERTY MARKING AS A DEFENSIVE TOOL

William J. Bailey, David J. Brooks  
Edith Cowan University, Perth, Australia  
b.bailey@ecu.edu.au; d.brooks@ecu.edu.au

## Abstract

*Any viable method of protecting property, dissuading the theft of property or ensuring the swift recovery of stolen property could be considered essential to general society. A number of crime preventive measures have been used in an attempt to achieve this objective. One such measure is property marking, employing various techniques to make property more readily identifiable. The study assesses technology to investigate effectiveness, both for dissuasion and for tracing once stolen. Mechanism for the disposal of stolen property forms an important part of this study, commencing with the mapping of the theft-supply-chain.*

*Using a mixed methods approach, the research project has set out to identify if security technology could be used to break what is termed the 'theft-chain-cycle', whereby articles are stolen, stolen to order or for barter. The theft-supply-chain is not a single linear model; rather property passes through a number of formal and informal chains prior to reaching its "new" illegal owner. A significant factor is the ease of disposal linked to ease of detection using property marking to aid conviction. Based upon the findings, potential strategies and changes in legislation that better direct limited resources can be developed to assist in curbing the growing level of burglaries.*

## Keywords

Crime Prevention; Theft; Property Marking; Theft-chain-cycle; Supply Chain; Burglary; Drugs.

## INTRODUCTION

The theft of property and its associated impact effects many parts of society. For example, a considerable amount of resources are expended in trying to reduce property theft, as such crime engenders both a financial and emotional impact (Grabosky, 1995, p. 1) on those involved. Factors such as fear of crime, increased insurance premiums and victimization are all outcomes of property crime.

Much of the past research has focused on the mitigation of such crimes, collectively termed as 'crime prevention'. Crime prevention are "any actions designed to reduce the actual level of crime and/or the perceived crime" (S.P. Lab, 2010, p. 26). Any viable method of property theft prevention, through dissuasion or ensuring its swift recovery once stolen, is a benefit to society. Such mitigation includes options that address situational features within the problem environment, such as the disposal of the stolen good and how these goods are moved from the perpetrator to the eventual new illegal owner.

Therefore, this paper outlines a security/criminology mixed methods research project that has set out to identify if new developments in property marking and identification security technology can be used to break what is termed the theft-chain-cycle. In addition, the study attempts to better understand the theft-chain-cycle that stolen property may move through: pre-theft to being stolen and sold on. Factors such stealing to order or to fund drug habits are considered, to assess the mechanisms involved in the movement of property once stolen. Based upon the results, potential strategies and changes in legislation can be determined to assist in curbing the growing level of residential and commercial burglaries, and more effectively direct limited resources such as Policing and crime prevention strategies.

## **Background**

One of the fundamental tenets of a capitalist society is the ownership of property. Value is created by ensuring ownership; therefore, it is the protection of the ownership that ensures value. To achieve such protection, the justice system was developed with the creation of police forces to dissuade theft through the rule of law, detection and imprisonment of those that commit theft. A considerable amount of effort and expense thus expended in trying to ensure property is not stolen, as not only is it the value of the property but also the sentimental attachment owners may have for their property that is at stake. If property cannot be held securely by the owner, the value of the property diminishes. Therefore, any viable method of protecting the property, dissuading the theft of the property or ensuring the swift recovery of the property once stolen, is seen as essential as well as beneficial to general society. Accordingly, such protection is termed as part of crime prevention.

A number of crime preventive and mitigating measures have been used to try and accomplish crime reduction of property theft. One such measure is the use of marking property; using various technologies to make property more readily identifiable (Australian Institute of Criminology, 2012). Such measures are driven as security technology becomes more progressive and has a greater level of reliance placed upon it (Cubbage & Brooks, 2012, pp. 98-99). A study currently being conducted in the City of Joondalup in Western Australia is monitoring goods that have been marked using "Microdot" technology, to assess whether this property marking technology is effective, both for dissuasion and for property tracing. In addition, in this study 'property marking' marking will entail a series of ancillary aspects associated with the theft of property and its disposal, including dealing with perceptions of the risk involved in stealing marked property. The disposal of property is considered to be at the core of the problem, as if it cannot be sold then there is little worth in stealing it. Selling may entail either redemption for cash or barter in exchange for goods such as drugs; which forms part of a factor in the theft-supply-chain cycle.

Consequently, this paper considers what can be termed the 'theft-chain-cycle', that is the process whereby the stolen property is disposed of for a level of redemption, normally by what are known as 'fences', being handlers of stolen property (Cromwell & McElrath, 1994). The theft-chain-cycle is often termed by some as the supply chain, but this has many other connotations, not just related to theft (Thomas, 2010). Accordingly, the term has been defined for this study as a process whereby goods are stolen for resale, profit, barter or to order. The latter being a demand led process, where goods are identified as having a higher resale value and are selected for theft (Cromwell & McElrath, 1994, p. 297). For example, such goods could be smart phones, game consoles or high market value motor vehicles. Such items are then stolen to order in exchange them for financial or personal reward; primarily drugs. The creation of such a theft-chain-cycle is often exploited by the knowledge that insurance companies will recompense the loss of the item to the legal owner, although owners too could be part of the cycle; gaining from the theft by receiving pay-outs from the insurers. A recent study by Gately (2012) and McGregor (2011) indicates goods are being stolen to barter for drugs and thus not being sold to traditional outlets.

This trend needs to be researched further, which will form part of the study to ascertain if the marking of property has any impact on this transaction type. The use of drugs to commit crimes has been indicated in previous studies (Adams, Sandy, Smith, & Triglone, 2008; Nurco, Hanlon, & Kinlock, 1991), but more needs to be known about using stolen goods for barter as opposed to selling to 'fences'. A theft chain is thus created in which goods are stolen, resold or bartered and then the replaced items bought with the insurance money become a target item once again.

## **Research Questions**

The study is a proposition that puts forward the following Research Questions:

1. Can the theft-supply-chain be identified and mapped?

## 2. Is property marking an effective crime prevention strategy?

A better understanding and mapping of the theft-chain-cycle will lead to a reduction in property theft crime, such as residential and commercial burglary. Reduction will be achieved through more directed use of government and Police resources, improved legislation, better policy and crime prevention practice.

### METHODOLOGY

The methodology extends an existing study, which is being conducted in the City of Joondalup, to better understand the theft-supply-chain. The current study is using a non-equivalent control group design to compare applied property marking; reviews metadata from internationally studies; and conduct semi-structured focus group interviews with stakeholders including police, insurance companies and pawn brokers to provide an in-depth understanding.

The mixed-methods research methodology divides the process into two streams that combines the data collected prior to undertaking further stages, based upon the first interpretation of the results. The Figure 1 illustrates the methodology, indicating the cleavage approach prior to the amalgamation of the two project strands.

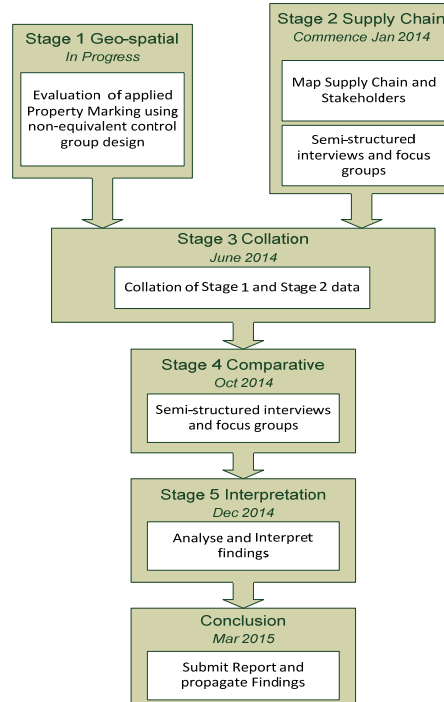


Figure 1 Research Methodology

The Stage 1 Geo-spatial evaluation is considered insufficient to understand the posed Research Questions, as quantitative analysis alone cannot provide an in-depth understanding of the value or otherwise of property marking and in particular, the theft-chain-cycle. Therefore, a qualitative critique and the mapping of the stolen property theft supply chain cycle, with its relevant stakeholders, will be undertaken. Once the supply chain is better understood, initial interviews and focus groups with those stakeholders will be undertaken to provide a greater understanding of the supply chain.

The supply will be mapped using a metadata analysis of the literature. As there is "no single definition that adequately describes metadata, though it often is referred to as "data about data" ... In other words, metadata is a set of highly structured and/or encoded data that describes a large set

of data” (Smith, & Hung, L, 2011, p. 464). Based upon the data acquired to position this study, a series of questions will be composed for semi-structured interviews and focus groups. The participants and groups will be selected by criterion sampling (Cohen, Manion, & Morrison, 2002). When designing the data collection, four aspects will be considered to ensure that the process evolves rather than being imposed, such as: the choice of participants and their relation to the study; alignment to the research objectives; broad data collection process to support sustained results; and the use of numerous sources to assist with the validity (Giacomini & Cook, 2000) and reliability of the findings.

#### **PROPERTY MARKING METHODS**

There are a number of methods that are currently in use for marking property, such as physical etching, ultra-violet marking, unique coding disks, and Electronic Article Surveillance (EAS) using Radio Frequency Identification (RFID) tags. Physical marking, where a personal identify is etched into the property, is one of the oldest and best known approaches. More recent physical etching is a long term solution, producing more permanent marks through the use of chemicals or laser cutting.

Ultra Violet (UV) Pens are able to write on an article, although the ink fades in direct sunlight so is not effective over a longer term. A further development is the use of unique coding disks, termed “microdots” or “DNA markers”. Microdots use tiny disks that have a unique identifier, which is registered to the legal owner. More recent unique coding disks use a uniquely coded synthetic DNA, which has a ‘tracer’ element in the synthetic substance applied to the property. DNA tagging should not be confused with the taking of DNA from individuals and kept on a data base (Juengst, 1999). When seen under a UV light, it shows up and indicates it has come from a marked article. The advantage of this system is that contact with the item also results in the markers being transferred to the culprit, which could be identified under UV. Many consider that the development of DNA tagging is one that has the most potential for the future of crime prevention (Brown & Reichert, 2010; Li & Rothberg, 2004; Marlow, 2011; Slater & Minton, 1998), although this method has its limitations.

Another property marking technology that is gaining wider acceptance is Electronic Article Surveillance (EAS) tags. These are attached to property, predominately in the retail trade, including the auto industry, read as bar codes or more currently, as Radio Frequency Identification (RFID). RFID transmit and receive unique codes using Radio Frequency signals (Smith & Brooks, 2013, p. 162). The advantage of RFID is that it does not require direct line of sight between the reader and the tag (Koh, Schuster, Lam, & Dinning, 2003, p. 5). The developments in the auto industry for article identification through the Electronic Product Code (EPC) have wide ranging potential for more general applications, and also for property owners to have access to the codes and the police to the identification reader technology (Engels, Sarma, Putta, & Brock, 2002; Sarma, Brock, & Ashton, 2000). Property owners could thus have a personal register of all the goods that have been tagged with EPCs, which could assist Police when they are checking for stolen goods. The ability to use a RFID reader, which can scan rapidly articles and register a ‘hit’ would be of substantial value, especially in the use of Police resources.

Limitations of these property marking techniques are the ease at which goods can be inspected by not only the legal authorities, such as Police, but also by the illegal persons. For example, physical etching can be ground-out, and microdots can be traced and removed. Even RFID can be found, although with larger and more valuable items, such as vehicles, these techniques can be embedded into the items electronics, making removal very difficult. Nevertheless, the degree at which tracing and removal becomes too much effect within the theft-supply-chain is significant and a factor that the study is investigating.

### **The Efficacy of Property Marking**

When assessing previous studies that have employed various measures for target hardening (Cozens & Davies, 2013) including the use of property marking, the results tend to indicate a reduction in burglaries (Forrester & Britain, 1990; Tilley & Webb, 1994). Nevertheless, despite a significant number of property marking programs (Lab, 2010, p. 63), there is no robust research to support the application of property marking. The central premise within property marking studies is that marking increases the difficulty of disposing of stolen property through the theft-supply-chain; however, few studies can demonstrate significant reduction in reported burglary, an increased return of stolen property (Laycock, 1984, p. 14) or an impact on arrests or convictions (Lab, 2010, p. 64).

Lab (2010) refers to two significant property marking studies, namely Laycock (1984), and Rhodes (1999). For example, Laycock (1985) found a significant reduction in burglaries of 40 percent in the first year of property marking, but that there was no significant effect on the theft-supply-chain. However, Laycock did not map the theft-supply-chain nor critiqued the flow of property through the chain. Rhodes, et al., (1999) study investigated the efficacy of property marking in the reduction of vehicle theft in the United States in relation to changes in the Anti-Car Theft Act of 1992, which compelled car manufacturers to property mark vehicles. Results, with caution, indicated that theft rates decreased as a greater number of vehicles had their parts marked. Whilst theft trends were already on their way down prior to intervention, Rhodes, et al., (1999, pp. 11-17) noted that as a greater number of high theft vehicles were marked, fewer were stolen, adding support towards property marking as an effective intervention.

Technology has improved many of these studies and it has been argued that these earlier studies lack sufficient rigour to allow generalise results (Crawford & Jones, 1996). In addition, many of the studies did not map the theft-supply-chain. Consequently the need for a study that incorporates a more robust methodology, coupled with the use of current and emerging technology would be appropriate at this time. In addition, the study should apply additional measures such as wide scale publicity which has been seen to improve crime reduction (Johnson & Bowers, 2003).

### **UNDERSTANDING THE THEFT-CHAIN-CYCLE**

The proposition put forward in the study is that a better understanding and mapping of the theft-chain-cycle will lead to a reduction in property theft crime. Reduction will be achieved through more directed use of government and Police resources, improved legislation, better policy and crime prevention practice.

According to a report by the British Police, property items can be termed as “hot products” with their attributes summarised by CRAVED. CRAVED is an acronym that defines the six elements that make property more or less attractive to thieves, being hot products must be Concealable, Removable, Available, Valuable, Enjoyable and Disposable. Nevertheless, according to Clarke the perpetuity of how much an item is stolen may depend critically on just one attribute, namely the ease of disposal (Clarke, 1999, p. iv). The ability to identify and characterize such items within such attributes will support an understanding of not only the theft-supply-chain, but also have different items may move through the theft-chain.

In Australia, it is important to investigate the role pawn shops have in facilitating the sale of stolen goods (Fass & Francis, 2004). By assessing the ease of moving goods onto willing buyers, it should be possible to identify what could dissuade, or break, this cycle from occurring (Brantingham, Brantingham, & Taylor, 2005). In addition, it will be important to ascertain how many other outlets, both formal and informal, there are for disposing of stolen property (Sutton, 1995). It is suspected that goods are not only sold in pawn shops, but also in pubs, car boot sales and online. Formal outlets may include pawn shops and similar shop front outlets; however, these may be relatively insignificant when compared to the informal theft-chain outlets. Informal outlets could be locations such as the pubs, car-boot sales, and increasingly, the internet such as online buy and sell sites.

The theft-supply-chain is unlikely to be a single step; rather stolen property will pass through a number of persons and or outlets ( $n$  transfer) before reaching the illegal owner (Figure 2). In addition, the study proposes that property is passed between the formal and informal chain as it moves through the chain.

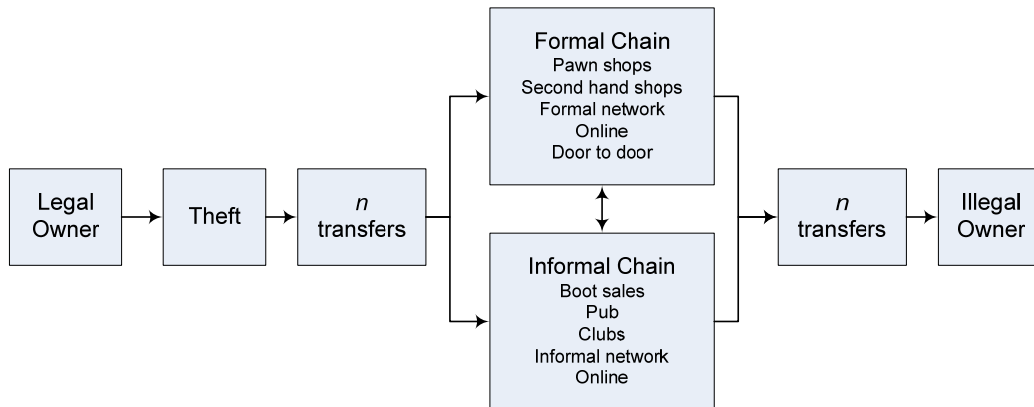


Figure 2 The Theft-supply-chain Flow Chart

The study findings of the theft-supply-chain will provide a benefit in devising more effective crime prevention strategies. For example, what type and application of property marking is more effective. Past research has shown that householders have a low take up rate in property marking, at no more than 10 percent (Lab, 2013, p. 63) and when take up rate is high >70 percent, there is a significant reduction in burglary rates. However, how other variables drive these figures requires greater research. The use of a wide scale marketing campaign would be one such addition to the process. Such positive outcomes would support changes to government legislation governing the pawn broker or second hand industry along with the promotion of such technology.

At present, there is little evidence to support changes to legislation within the pawn shop or second hand licence requirements. However, the study findings may provide the support to steer legislative change towards the adoption of policy and supporting practice for the checking of marked property prior to sale, and the mandatory notification to Police of suspected stolen property. In addition, if this could be achieved by the use of a RFID scanner, rather than checking property against a manual register, then the whole process would become far more effective in identifying stolen property. The knock on effect would be for ‘fences’ to ensure they were not purchasing stolen goods in the first place.

**CONCLUSION**

Breaking the theft-chain-cycle is the stated aim of this research project, assessing how far new and emerging technology can achieve this desired aim is yet to be determined. By linking this research project with an existing field study, the intention is to support the statistical analysis with a further interpretation of the results though focus groups based upon criterion selection. By using focus groups made up of criminology experts, Police, correctional services and pawn brokers, a qualitative interpretation can be provided. Furthermore, the study seeks to link an existing on-going research that has used convicted felons to gauge their interpretation of whether they would be more reluctant to steal property that can be easily traced and thus aid conviction.

The theft-supply-chain has been presented, detailing the formal and informal elements of the chain. One key aspect is the characteristic of property, being the ease at which disposal can be achieved. Such understanding, linked with a greater understanding of the theft-supply-chain, can better support directed mitigation strategies, where limited resources can best be applied. Such directed strategies could, in essence, break the theft-chain-cycle.

## REFERENCES

- Adams, K., Sandy, L., Smith, L., & Triglone, B. (2008). *Drug use monitoring in Australia: 2007 annual report on drug use among police detainees*: Australian Institute of Criminology.
- Australian Institute of Criminology. (2012). Effective crime prevention interventions for implementations by local government - Residential burglary,. from [http://www.aic.gov.au/publications/current%20series/rpp/100-120/rpp120/10\\_burglary.html](http://www.aic.gov.au/publications/current%20series/rpp/100-120/rpp120/10_burglary.html)
- Brantingham, P.L., Brantingham, P.J., & Taylor, W. (2005). Situational crime prevention as a key component in embedded crime prevention. *Canadian Journal of Criminology and Criminal Justice*, 47(2), 271-292.
- Brown, Jason, & Reichert, Bas. (2010). European Patent Application.
- Clarke, R. (1999). Hot products: Understanding, anticipating and reducing demand for stolen goods *police Research Series 112*. London, England: Home Office, Policing and Reducing Crime Unit, Research, Development and Statistics Directorate.
- Cohen, L., Manion, L., & Morrison, K. (2002). *Research methods in education* (5th ed.). London: RoutledgeFalmer.
- Cozens, P., & Davies, T. (2013). Crime and residential security shutters in an Australian suburb: Exploring perceptions of 'Eyes on the Street', social interaction and personal safety. *Crime Prevention & Community Safety*, 15(3), 175-191.
- Crawford, A., & Jones, M. (1996). Kirkholt revisited: Some reflections on the transferability of crime prevention initiatives. *The Howard Journal of Criminal Justice*, 35(1), 21-39.
- Cromwell, P., & McElrath, K. (1994). Buying Stolen Property: An Opportunity Perspective. *Journal of Research in Crime and Delinquency*, 31(3), 295-310. doi: 10.1177/0022427894031003003
- Cubbage, C., & Brooks, D. J. (2012). *Corporate Security in the Asia Pacific Region: Crisis, Crime, Fraud and Misconduct* Boca Raton: Taylor and Francis.
- Engels, D.W, Sarma, S.E, Putta, L., & Brock, D. (2002). *The Networked Physical World System*. Paper presented at the ICWI.
- Fass, S.M., & Francis, J. (2004). Where have all the hot goods gone? The role of pawnshops. *Journal of Research in Crime and Delinquency*, 41(2), 156-179. doi: 10.1177/0022427803258384
- Forrester, D., & Britain, G.. (1990). The Kirkholt burglary prevention project: Phase II. London, England: Crime Prevention Unit, Home Office, London.
- Gately, N., Fleming, J., McGregor, C., & Morris, R. (2012). *Amphetamine using police detainees in Western Australia: What is the impact on crime?* Paper presented at the Western Australian Drug & Alcohol Conference, Burswood Convention Centre, Perth. .
- Giacomini, M.K., & Cook, D.J. (2000). Users' guides to the medical literature. *JAMA: The journal of the American Medical Association*, 284(3), 357. doi: 10.1001/jama.284.3.357
- Grabosky, P. N., (1995). *Burglary Prevention. Trends and Issues in Crime and Criminal Justice (No. 49)*. Canberra: Australian Institute of Criminology.
- Johnson, S. D., & Bowers, K.J. (2003). Opportunity is in the eye of the beholder: The role of publicity in crime prevention. *Criminology & Public Policy*, 2(3), 497-524. doi: 10.1111/j.1745-9133.2003.tb00011.x
- Juengst, E.T. (1999). I-DNA-fication, personal privacy, and social justice. *Chi.-Kent L. Rev.*, 75, 61.



- Koh, R., Schuster, E.W., Lam, N., & Dinning, M. (2003). Prediction, detection, and proof: an integrated auto-ID solution to retail theft. *White Paper, Auto-ID Lab, University of Cambridge, Cambridge*.
- Lab, S.P. (2013). *Crime Prevention: Approaches, Practices and Evaluations* (8th ed.). Burlington: Elsevier.
- Lab, S.P. (2010). *Crime Prevention: Approaches, Practices and Evaluations* (7th ed.). Burlington: Elsevier.
- Laycock, G. (1984). *Property Marking: A Deterrent to Domestic Burglary?* London: Home Office Crime Prevention Unit.
- Li, H., & Rothberg, L.J. (2004). DNA sequence detection using selective fluorescence quenching of tagged oligonucleotide probes by gold nanoparticles. *Analytical chemistry*, 76(18), 5414-5417.
- Marlow, A. (2011). Linking crime prevention with science education: An assessment of a DNA property-marking crime prevention scheme in secondary school education. *Safer Communities*, 10(2), 5-10. doi: 10.5042/sc.2011.0180
- McGregor, C., Gately, N., & Fleming, J. (2011). Prescription drug use among detainees: Prevalence, sources and links to crime. *Edith Cowan Research on line*.
- Nurco, D.N., Hanlon, T.E., & Kinlock, T.W. (1991). Recent research on the relationship between illicit drug use and crime. *Behavioral Sciences & the Law*, 9(3), 221-242. doi: 10.1002/bsl.2370090303
- Rhodes, W.J., Johnston, P., & McMullen, Q. (1999). *An Evaluation of the Effectiveness of Automobile Parts Marks on Preventing Theft*. Washington, DC: Abt Associates Inc.
- Sarma, S., Brock, D.L., & Ashton, K. (2000). The networked physical world. *Auto-ID Center White Paper MIT-AUTOID-WH-001*.
- Slater, J.H., & Minton, J.E. (1998). Methods and devices for marking a solid and subsequently detecting the markings: Google Patents.
- Smith, C., & Hung, L. (2011). Metadata. Encyclopedia of Survey Research Methods. Sage Publications, Inc. In P. Lavrakas (Ed.), Encyclopedia of Survey Research Methods. In null (Series Ed.): Sage Publications, Inc. Retrieved from <http://dx.doi.org/10.4135/9781412963947>. doi: 10.4135/9781412963947
- Smith, C. L., & Brooks, D. J. (2013). *Security Science: The Theory and Practice of Security* Waltham, MA: Elsevier.
- Sutton, M. (1995, 1995 Summer). Supply by theft: does the market for second-hand goods play a role in keeping crime figures high? *British Journal of Criminology*, 35, 400-416.
- Thomas, A. (2010). *Supply chain security: International practices and innovations in moving goods safely and efficeintly*. Santa Barbara, CA: Greenwood Publishing Group.
- Tilley, N., & Webb, J. (1994). *Burglary reduction: Findings from safer cities schemes* (Vol. 51). London, England: Home Office Police Research Group.