

ProAuthent

Integrated Protection against Counterfeiting in Mechanical Engineering through Marking and Authenticating Critical Components

**Dipl.-Wi.-Ing.
Dominik Stockenberger**

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A2: Supply Chain Security**



fml - Lehrstuhl für Fördertechnik Materialfluss Logistik
Prof. Dr.-Ing. Dipl.-Wi.-Ing. W. A. Günthner
Technische Universität München

1 Product Piracy in Mechanical Engineering

2 Integrated Protection System

2.1 At-Risk Components

2.2 Fraud-Resistant Features and Originality Check

2.3 Check Results and Documentation

3 Summary

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Global Impact

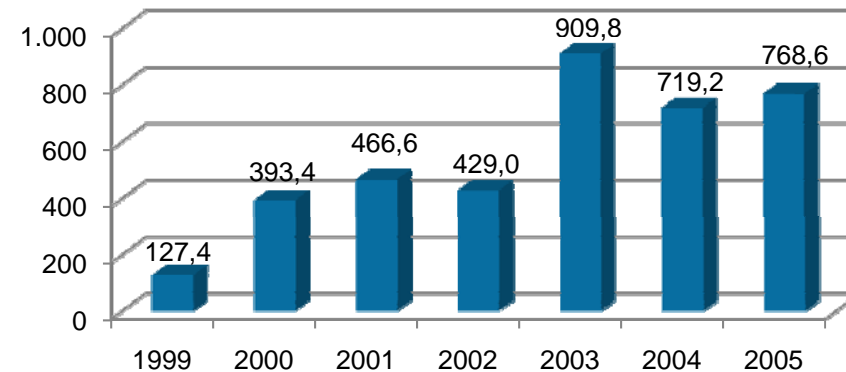
- **International trade with fake and illicitly copied products 2005: \$200 billion per year**

Containing only goods of cross-border trading, no fakes/copies in national trade or internet distributed products

- **Actual volume could equate to several hundred billion US\$ more**

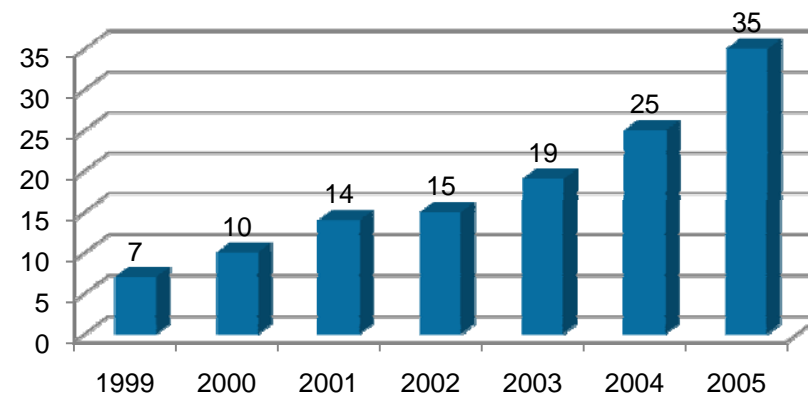
Source: [OECD-08]

Volume of Goods assured by Customs [Mio US \$]



Source: [OECD-08] p.57

Number of Countries Reporting to the OECD



Source: [OECD-08] p.57

Impact on Mechanical Engineering in Germany

- **Economical damage due to product piracy:
€7 billion per year**
- **68% of German mechanical engineering enterprises are affected**

Source: [VDMA-08]

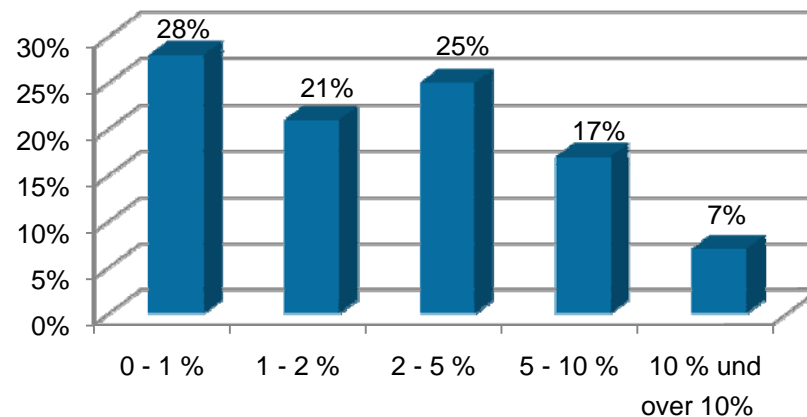
Direct economical damages

- Loss of sales and profit
- Expenses for protection measures, registration and assertion of trademark rights and patents

Indirect economical damages

- Damage to reputation
- Sinking price level
- Product liability
- Loss of know-how

Estimated Loss in Sales at Affected Companies 2007



Source: [VDMA-08]

Distinguishing between Originals and Counterfeits

- **High product quality – no longer a measure for product authenticity:**
Differences between original product and counterfeits are often hardly noticeable for customers
 - **Meaning to expanded supply chains and sales networks:**
Challenge of communicating to all participants differentiating features
- ➔ **Trademark protection approach:**
Product protection by marking with fraud resistant features for sustainable (manual) authentication



Source: Aktionskreis gegen Produkt- und Markenpiraterie e.V. (APM)

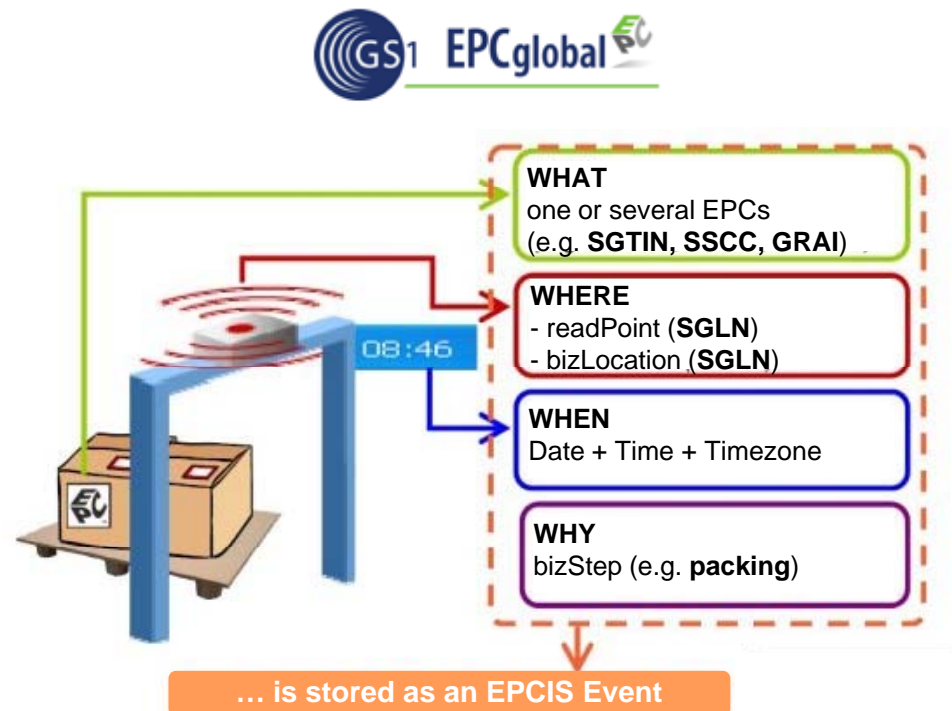
Supply Chain Surveillance

- **Simple supply and logistics structures** become complex supply and logistic networks
- **Tracing one's own products** along the supply chain and discovering counterfeits, illicit sales etc. becomes uncontrollable without qualified systems



Logistics approach:

Applying tracking and tracing functions based on databases which store information about the serialized product's progress through the logistics chain



Source: [GS1-10]

Anti-Counterfeiting for Components and Spare Parts in Mechanical Engineering

Trademark protection approach: Marking with fraud resistant features

Availability of information
about the components'
Authenticity solely on-site

Logistics approach: Tracking and Tracing

Implementation of an area-wide
online data comparison system
necessary



**Efficient protection system against product
piracy for mechanical engineering?**

Research project **ProAuthent** funded by The
Federal Ministry of Education and Research
(Bundesministerium für Bildung und Forschung)

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2.1 At-Risk Components

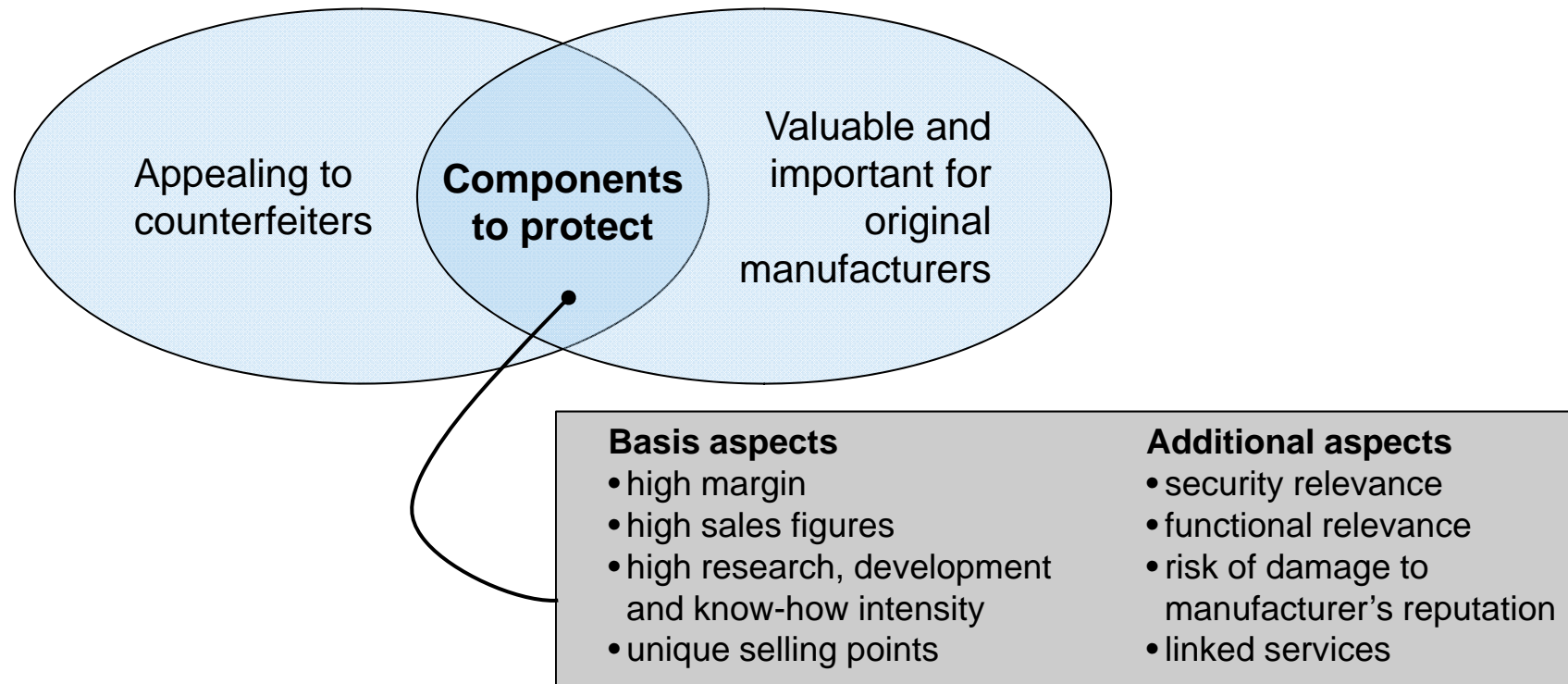
2.2 Fraud-Resistant Features and Originality Check

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- Marking every component with fraud resistant features and to checking authenticity is cumbersome
- Cost-benefit ratio prohibits marking every component

→ **Criteria for the selection of components to protect must be developed**



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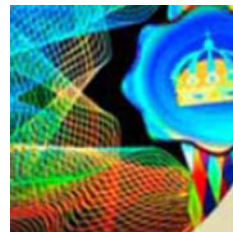
2.2 **Fraud-Resistant Features and Originality Check**

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Selected marking technologies

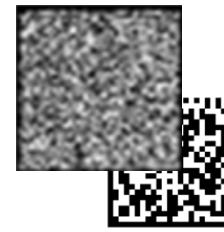
The following four marking technologies are realized in a demonstration system and industrial pilot installations



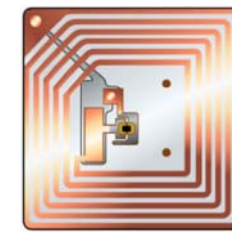
Hologram



IR color pigments



Copy detection pattern

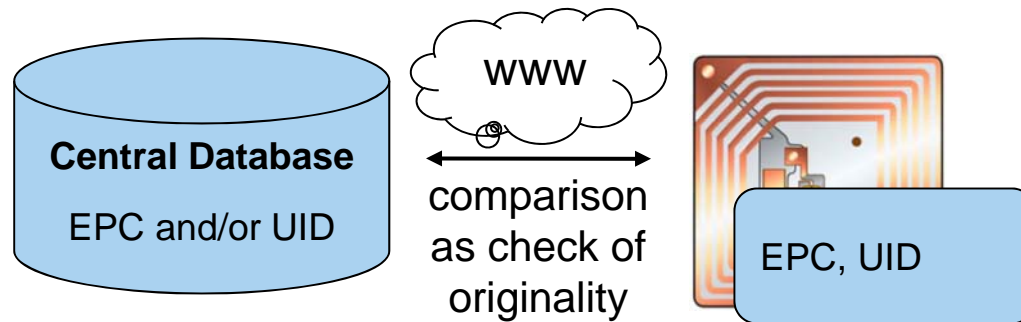


RFID

Secure on-site authentication (offline)				Not with simple software
Data transfer in central data base for transparency along the SC	Via manual input			

RFID: Authentication Mechanism with Cryptographic Signature for Offline-Authentication

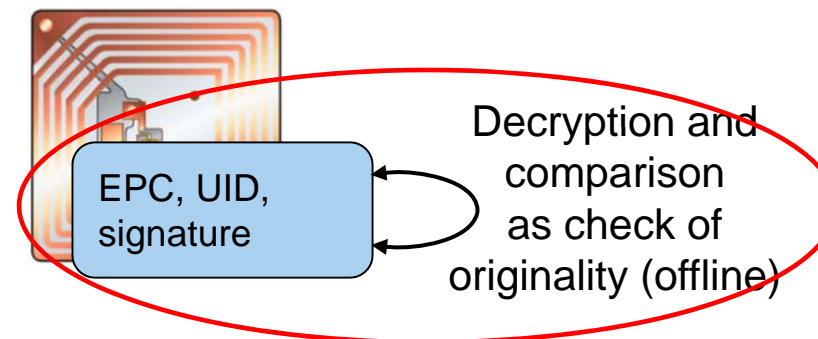
Online-Authentication



- Electronic Product Code (EPC): easily reproducible
 - Unique tag ID (UID): written in the read-only-memory of the chip, reproduction very expensive and complex
- Security level using UID is very high

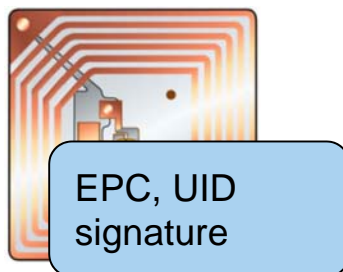
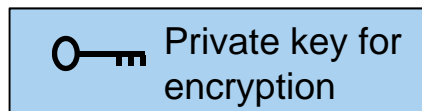
Offline-Authentication

- EPC + UID are signed by the manufacturer
 - EPC and signature of a tag can only be copied to transponders with same UID
- Secure mechanism applicable in mechanical engineering



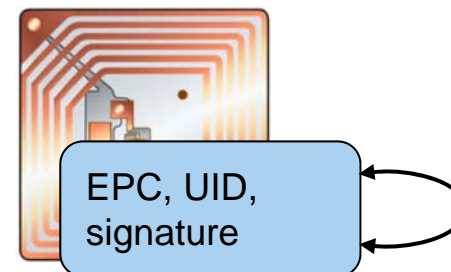
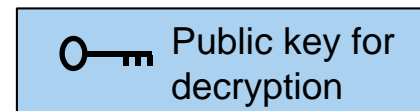
RFID: Authentication Mechanism with Cryptographic Signature for Offline-Authentication

Manufacturer



- Generation of the signature on the basis of EPC and UID

Point of Authentication



- Decryption of the signature
- Comparison with EPC and tag ID for originality check

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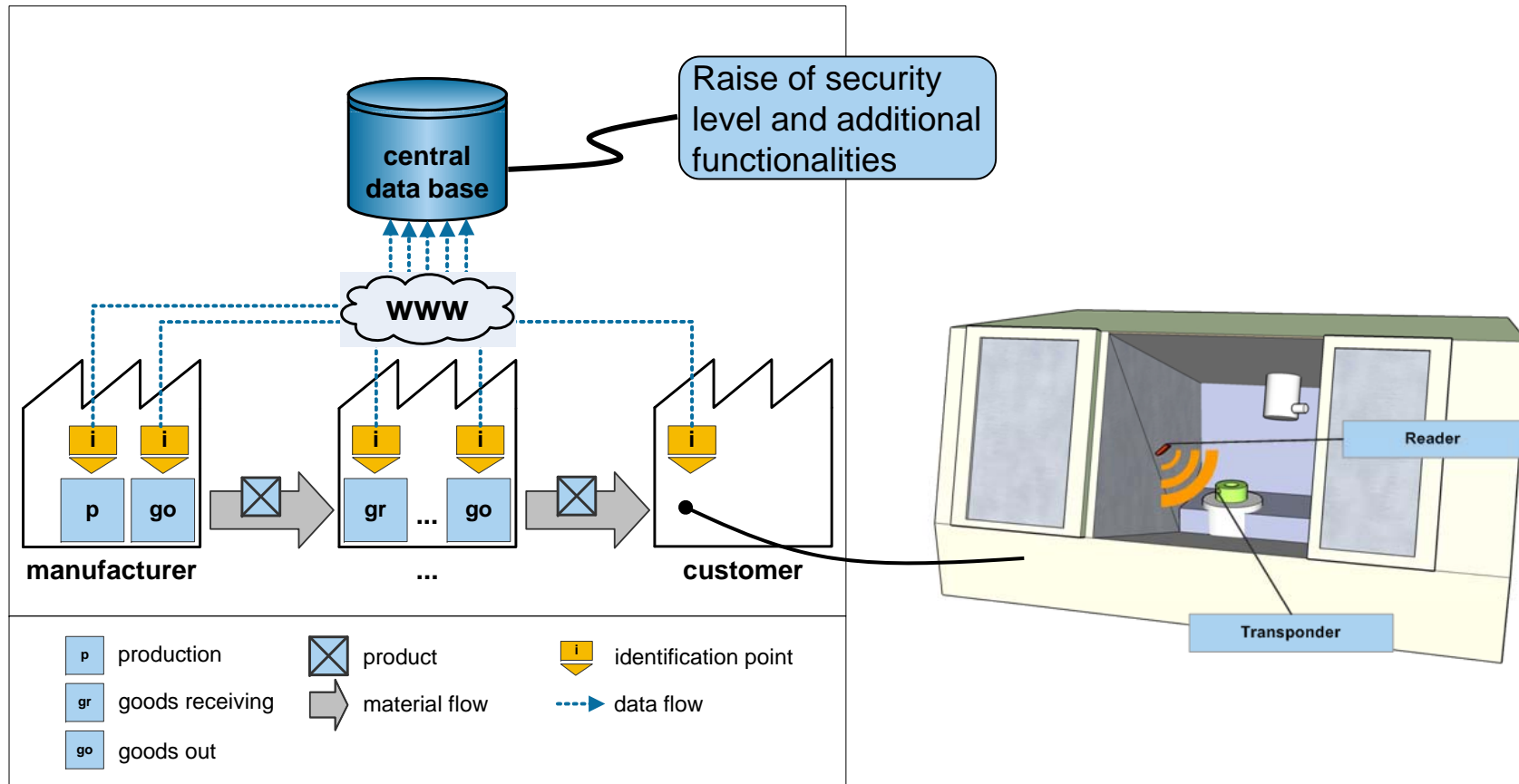
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Data Transfer from every Point of Authentication to Central Database

Offers customers, retailers and manufacturers various possibilities for data analysis and additional benefits (condition monitoring, customers classification etc.)



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Functions of the ProAuthent-System

Basic Functions:

- ✓ Marking of “at-risk” parts and components with fraud resistant features to distinguish between originals and counterfeits
- ✓ Possibility of a secure on-site authentication (offline) for different marking technologies to be sure of the originality
- ✓ Possibility to transfer checking results to a central data base

Functions of tracking and tracing:

- ✓ Tracing of products along the supply chain with different authentication points to protect the whole supply chain against counterfeits
- ✓ Protection of machines
- ✓ Increasing the transparency along the SC
- ✓ Documentation in the central database for subsequent traceability

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Thanks a lot!
Any questions?



Technische Universität München



GEFÖRDERT VOM



Bundesministerium
für Bildung
und Forschung

BETREUT VOM



PTKA
Projektträger Karlsruhe
im Karlsruher Institut für Technologie

- [BMBF-06] Bundesministerium für Bildung und Forschungs:
21. Bekanntmachung, Rahmenkonzept „Forschung für die Produktion von morgen“, Themenfeld: „Innovationen gegen Produktpiraterie“
BMBF, Bonn, 08.08.2006
- [Buc-05] Buchanan, J., Russell, P., Jausaovec, A.-V., Petit, D., Seem, P., Xiong, G., Atkinson, D., Feton, K., Allwood, D., Bryan, M.:
'Fingerprinting' documents and packaging
Unique surface imperfections serve as an easily identifiable feature in the fight against fraud.
In: Nature, Ausgabe des 28.07.2005, S.475, London 2005
- [Fuc-06] Fuchs, H. J.; Kammerer, J.; Ma, X.; Rehn, I. M.:
Piraten, Fälscher und Kopierer
Strategien und Instrumente zum Schutz geistigen Eigentums in der Volksrepublik China
Gabler, Wiesbaden, 2006
- [GS1-10] www.gs1-germany.de
Date: 11 June 10
- [ICC-06] ICC – International Chamber of Commerce:
anti-counterfeiting technology
A guide to Protecting and Authenticating Products and Documents
ICC, Barking (GB), 2006
- [Mal-05] Malik, H.; Schindler, S.:
Fälschungssichere Verpackungen
Sicherheitstechnologien und Produktschutz
Hüthig, Heidelberg, 2005

- [OECD-08] OECD:
Die wirtschaftlichen Folgen von Produkt- und Markenpiraterie
OECD, Paris, 2008
- [PTB-09] PTB – Physikalisch-technische Bundesanstalt:
http://www.ptb.de/de/org/4/nachrichten4/2006/metro_1.htm
Aufruf am 29.10.2009
- [REU-09] Rat der EU:
Sicherheitsdokumente
Sicherheitsmerkmale und andere einschlägige Fachbegriffe
<http://www.consilium.europa.eu/prado/DE/glossaryPopup.html>
Aufruf am 29.10.2009
- [VDMA-08] VDMA:
Produkt- und Markenpiraterie in der Investitionsgüterindustrie 2008
VDMA, Frankfurt a.M., 2008
Bundesministerium für Bildung und Forschung
- [Wil-07] Wildemann, H.; Ann, C.; Broy, M.; Günthner, W.A.; Lindemann, U.
Plagiatschutz
Handlungsspielräume der produzierenden Industrie gegen Produktpiraterie
TCW, München, 2007
- [Win-07] Winkler, I.; Wang, X.:
Made in China – Marken- und Produktpiraterie
Strategien der Fälscher & Abwehrstrategien für Unternehmen
Verlag für Interkulturelle Kommunikation, Frankfurt a.M., London 2007

www.fml.mw.tum.de

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**Thanks a lot!
Questions?**