Towards a Capability Maturity Model for Digital Forensic Readiness

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Agenda

1. **Introduction to Digital Forensics**
2. Digital Forensics in Enterprises
3. Need for Digital Forensic Readiness
4. Capability Maturity Model for Digital Forensic Readiness

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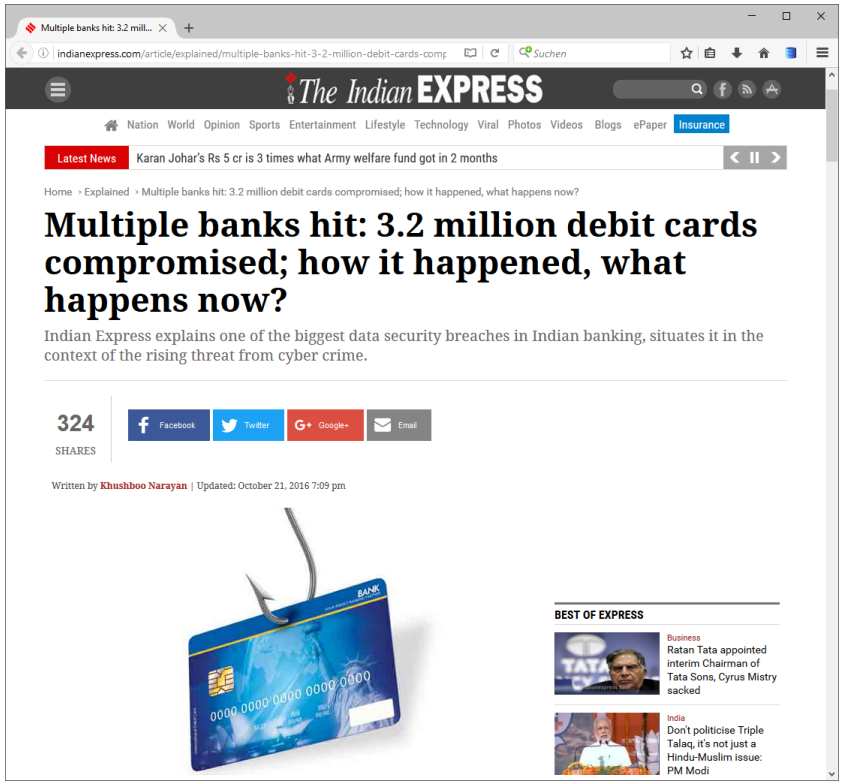
Motivation – Why do we need digital forensics?



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Digital Forensics Definitions

Digital forensics deals with scientific methods from computer science to provide legitimate and correct digital evidence in a court of law / or the legal system.

- **E.g. cases of computer misuse**
- **To clarify fraud and computer related crime**

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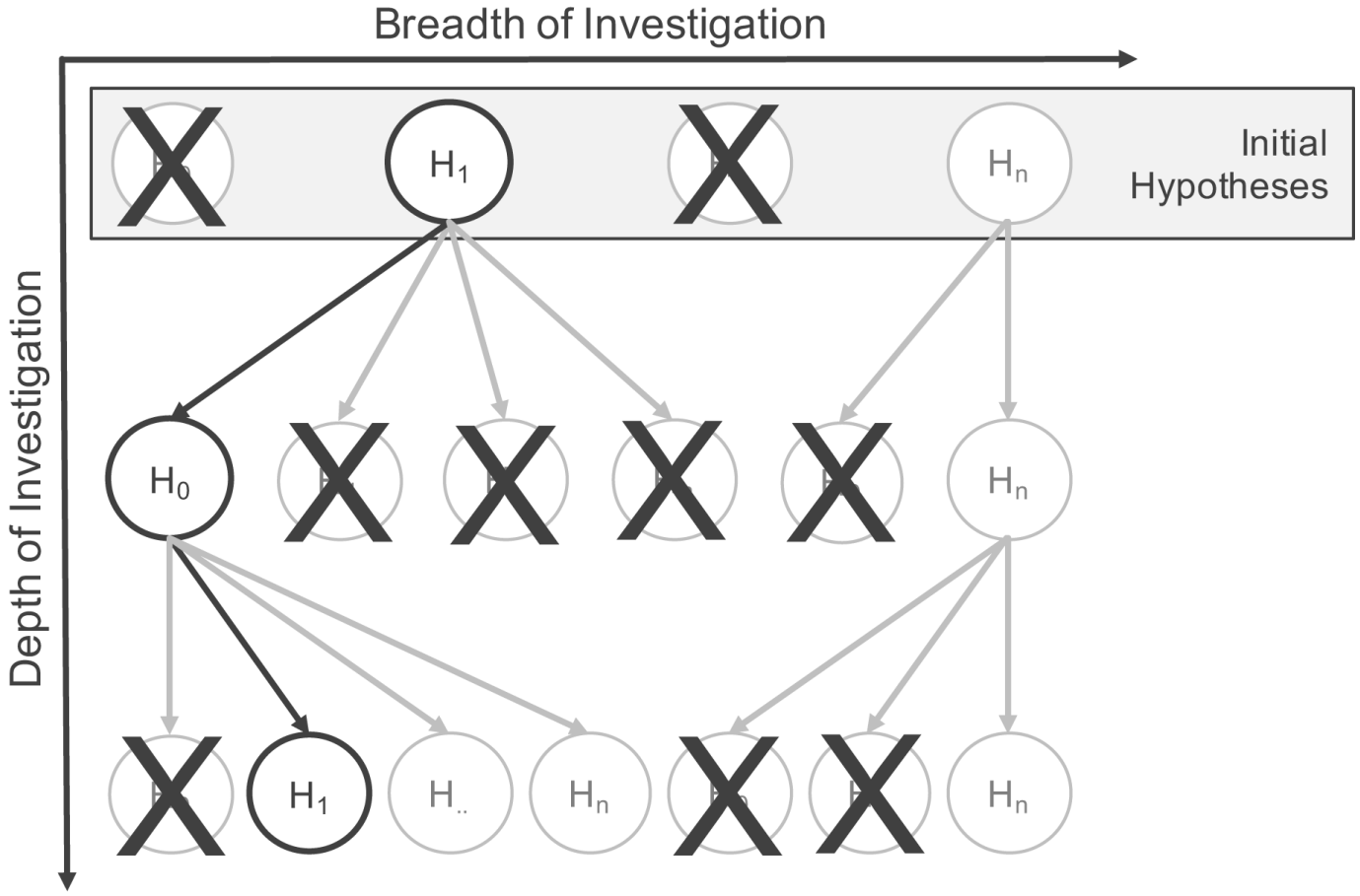
Scientific Method: Hypothesis Testing



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Digital Evidence

- **Any data stored or transmitted using a computer that support or refute a theory of how an offense occurred or that address critical elements of the offense such as intent or alibi.**

  (Casey2011, p.7)

- **Digital evidence is also physical evidence in the first place**
  - Magnetization on the surface of a hard disk
  - Electromagnetic waves on a data cable
  - Transistor's state of charge

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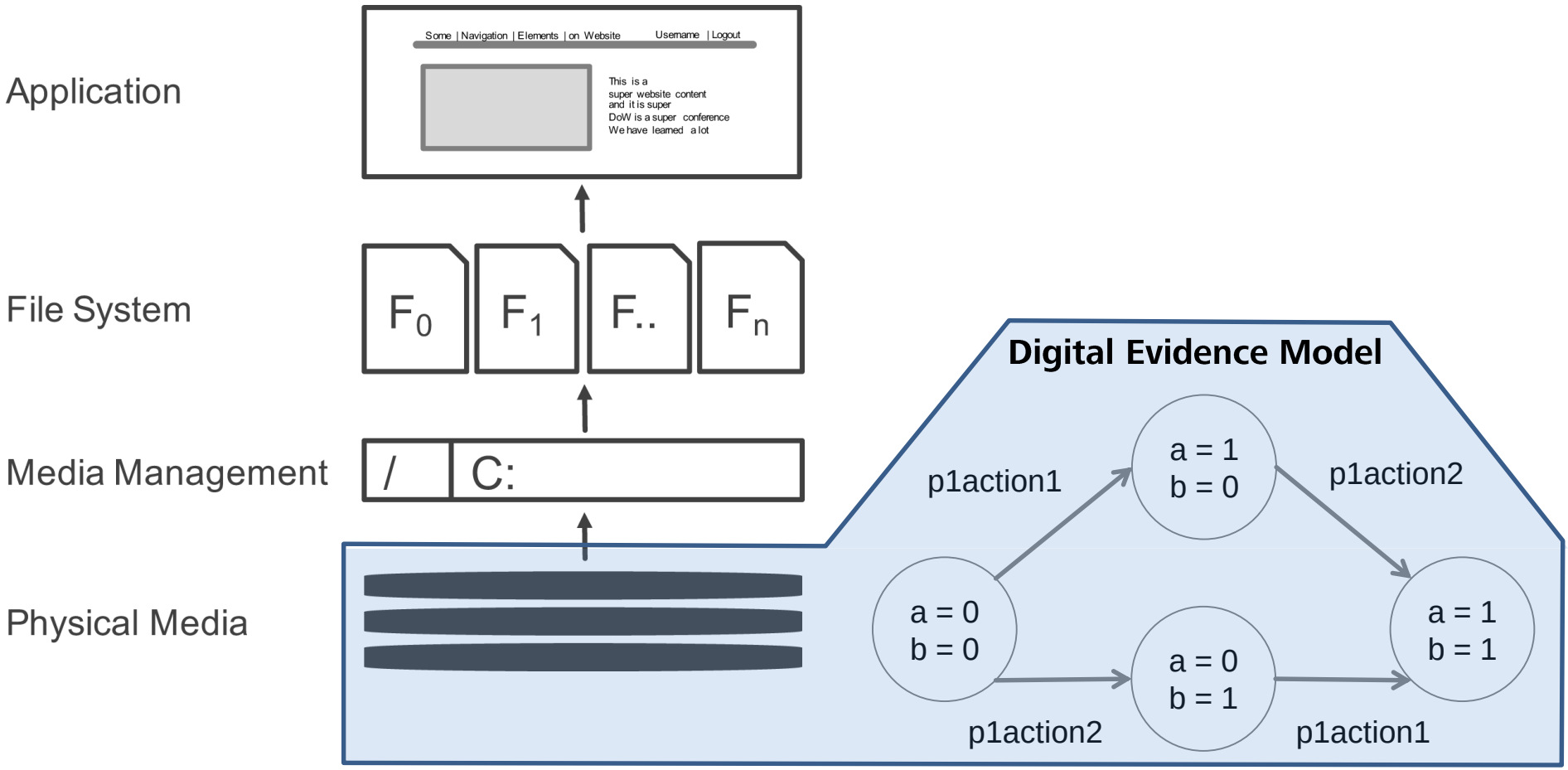
Digital Evidence Abstraction Layers



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What is the basis to infer certain actions in real life computer systems?

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Basic Forensic Principles in the Digital World

Question: Did computer A visit website B?

1. **Identify** files which might potentially be useful
2. **Classify** preserved files as browser cache files
3. Analyze content of cached files to find **individual** characteristics like cached user name, specific site, content of sites, timestamp of files, …
4. Establish an **association** between the website B and the computer A based on the outcomes of the previous step.

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Digital Evidence Problems

- **Generally not tamper resistant**
- **Easy alterable**

- **Digital Evidence is not directly linkable to a natural person**

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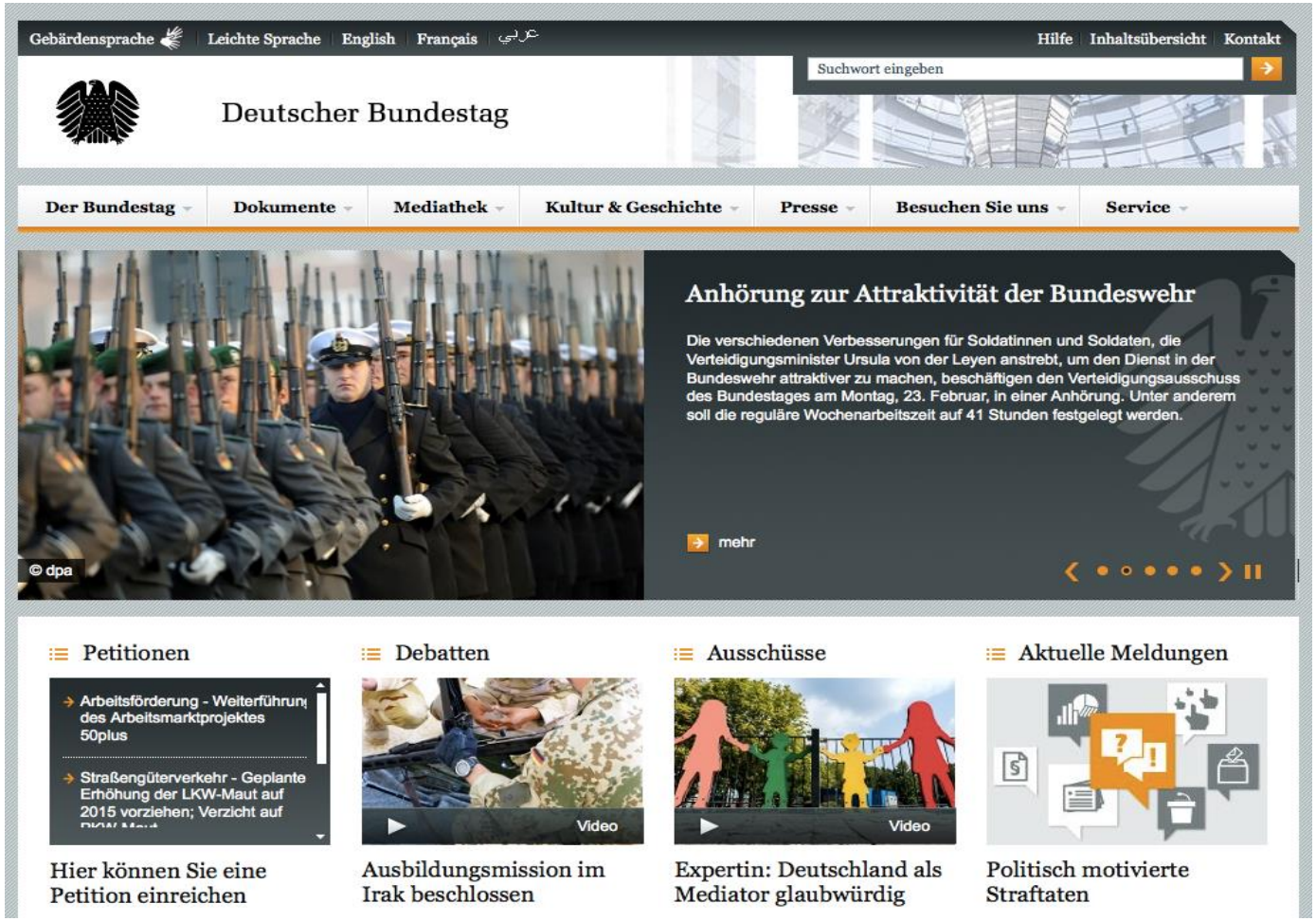
DDoS-Attack on www.bundestag.de



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(Basic) Forensic investigation process

Secure and collect digital evidence from the crime scene

Decide which evidence/data is relevant to the case

Interpretation of data

Correlate evidence

Handle uncertainty

Assess likelihood of events

Write a Report

Present evidence in a court of law

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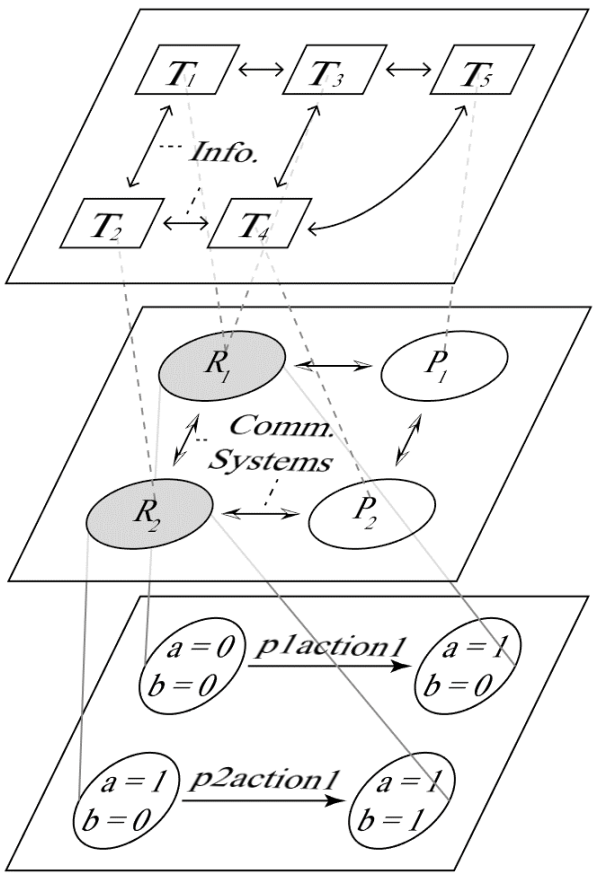
Digital Forensics in Enterprises

Relationships between the task, the application software level and operations on physical devices



Tasks performed by employees

Application software level supporting a business process within an enterprise
(e.g. ERP-Software)

Operations on physical devices
(e.g. open file, read/write/delete/append, close file)

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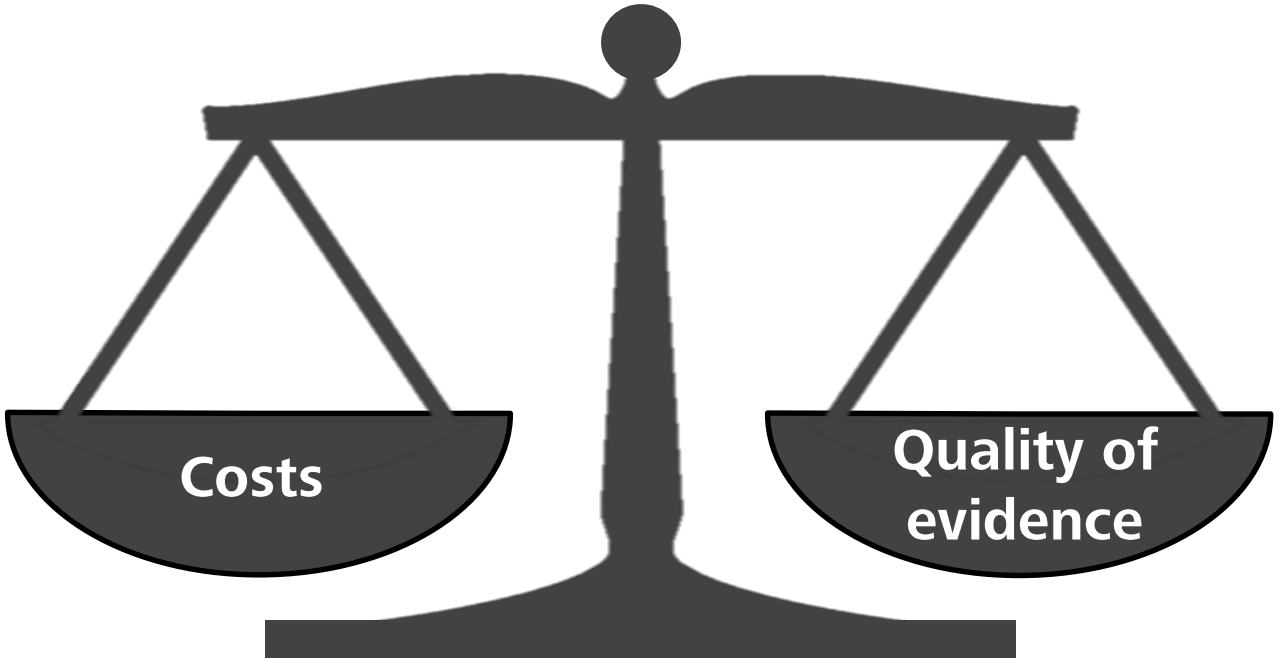
Digital Forensic Readiness Goals

1. **Maximize an environment's ability to collect credible digital evidence.**
2. **Minimize the cost of forensics in an incident response.**

(Tan 2001)



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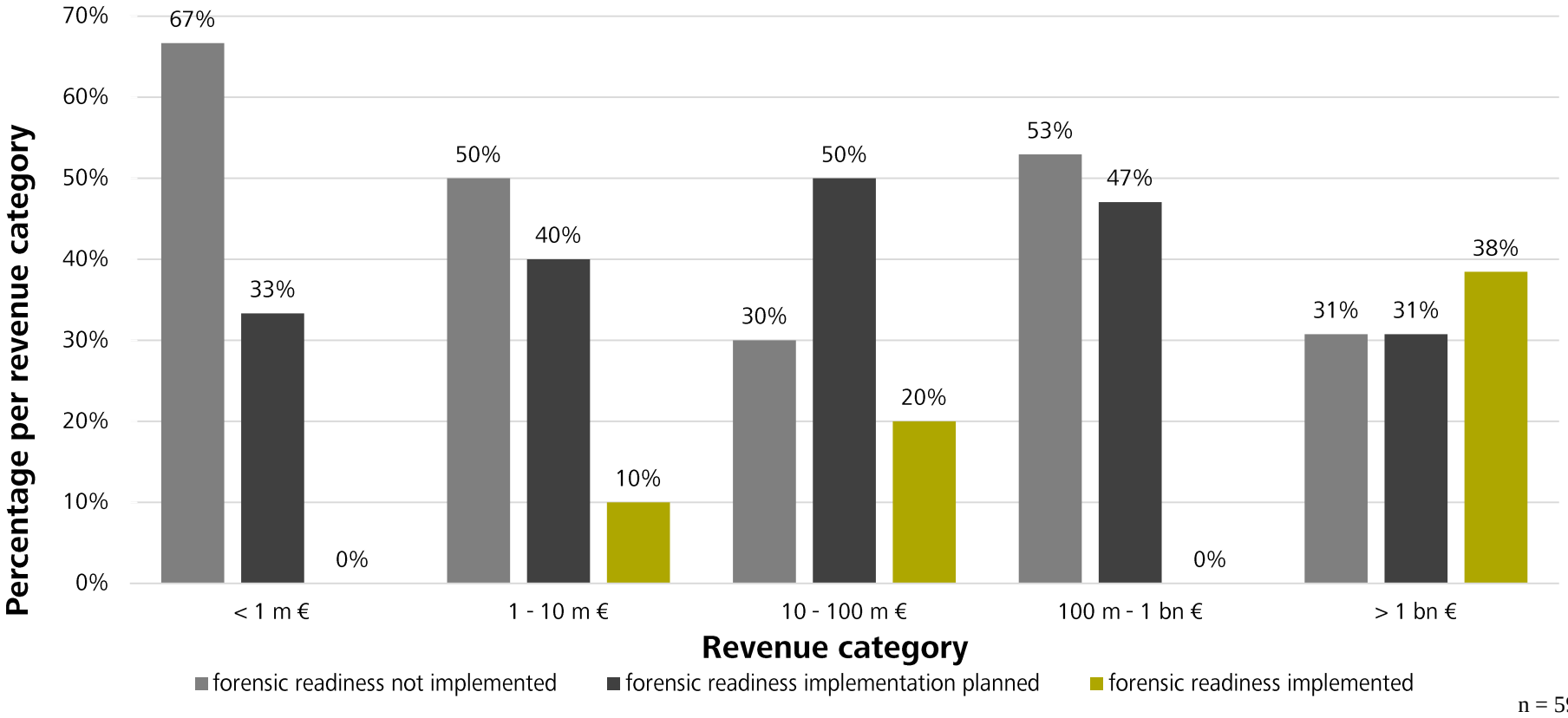
Forensic Readiness in Organizations



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How to implement Digital Forensic Readiness – Capability Levels

Step 1: Defining capability levels

Description of the defined capability levels

Level	Description
0 - Incomplete	The DF related objectives are not reached.
1 - Performed	The intended goals in DF are reached.
2 - Managed	DF initiatives and activities are managed and not ad-hoc performed.
3 - Completely defined	A standardized process for DF activities is in place. The procedures underlie a continuous improvement.

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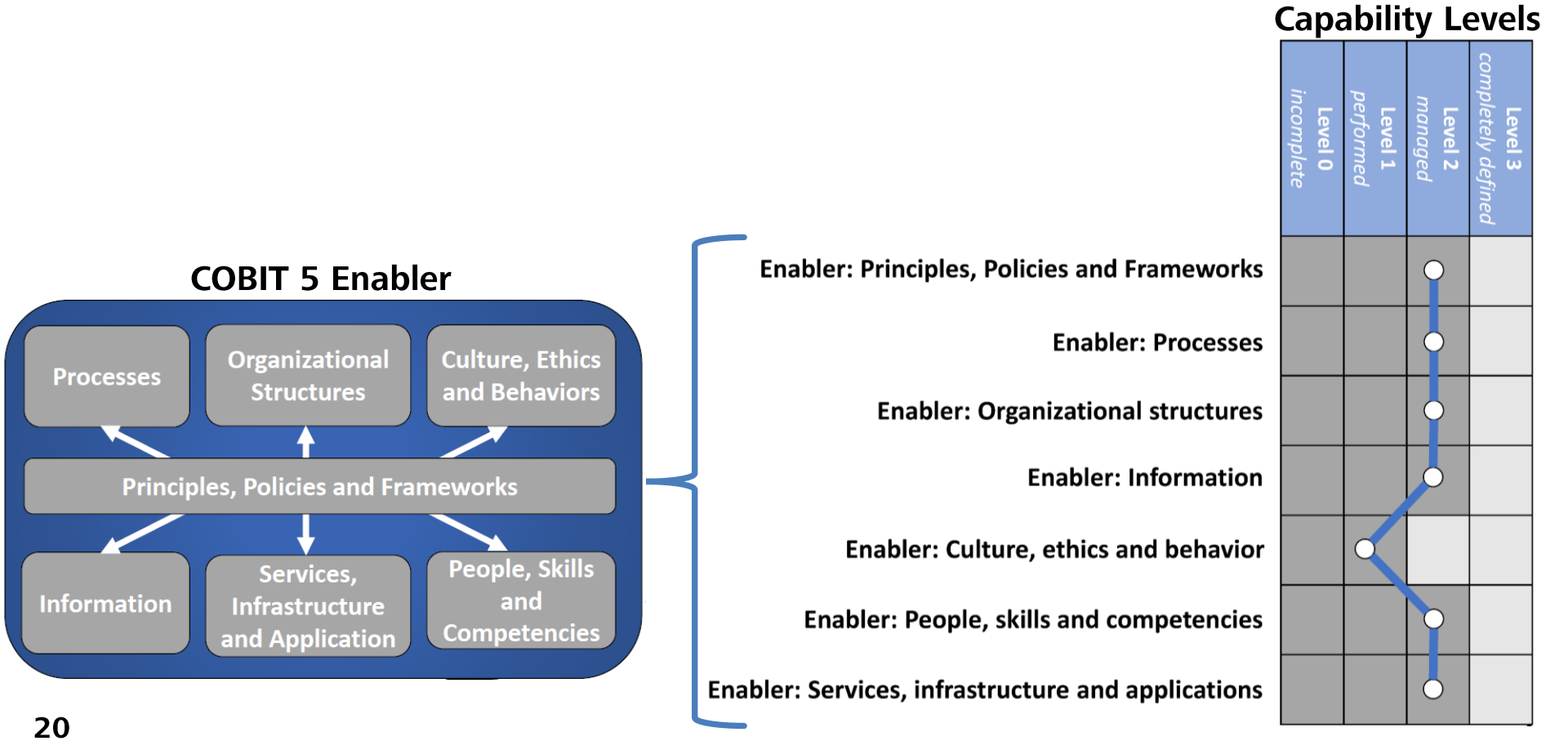
How to implement Digital Forensic Readiness – IT-Governance

Step 2: For each COBIT 5 enabler a certain level of capability can be determined



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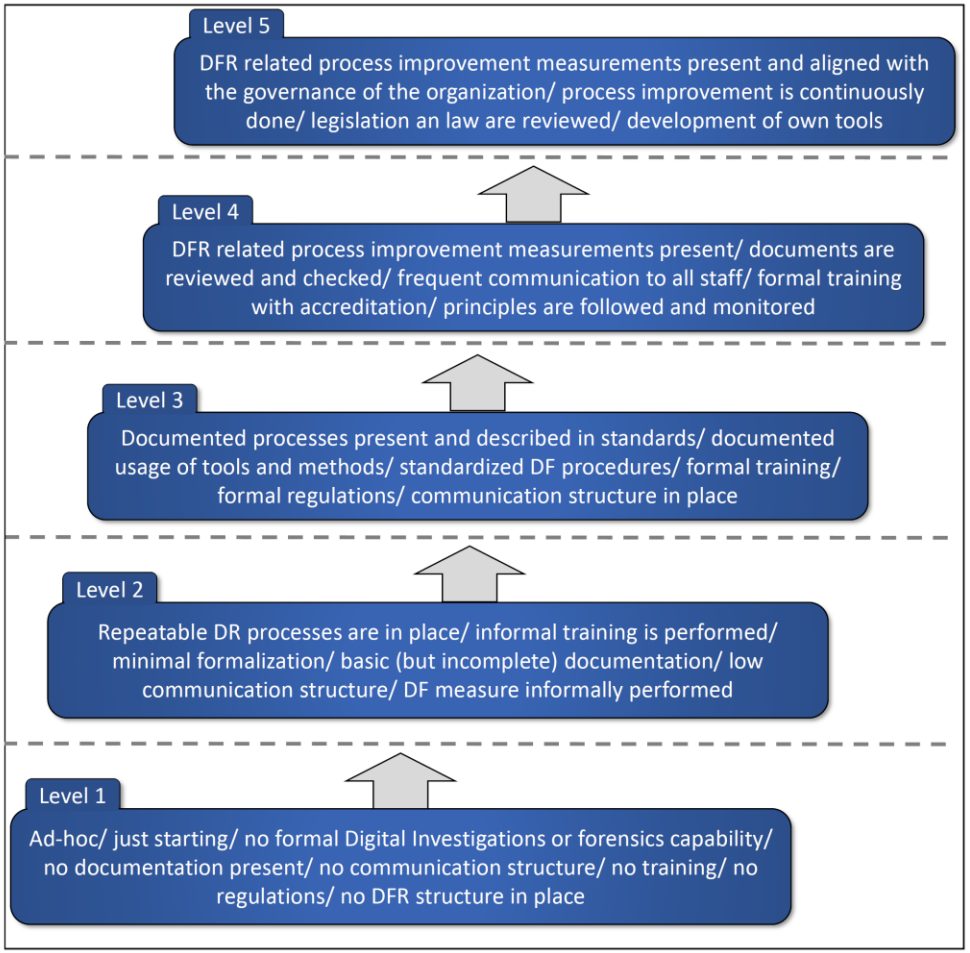
How to implement Digital Forensic Readiness – Maturity Levels

Step 3: Defining maturity levels



- *„Optimized“*
- *„Quantitatively Managed“*
- *„Defined“*
- *„Managed“*
- *„Initial“*

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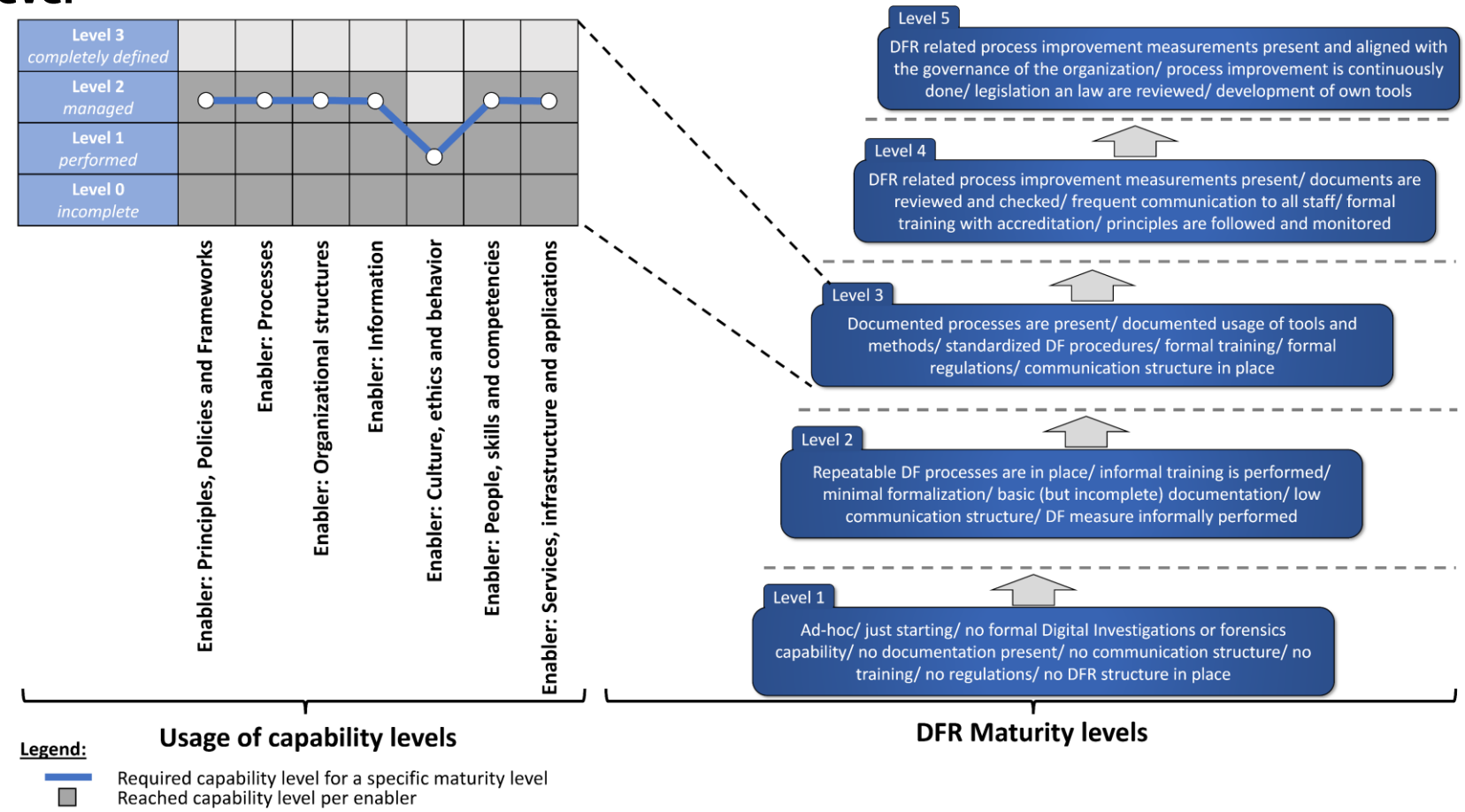
How to implement Digital Forensic Readiness – Overview

Step 4: A specific set of capability levels per Enabler defines a specific maturity level



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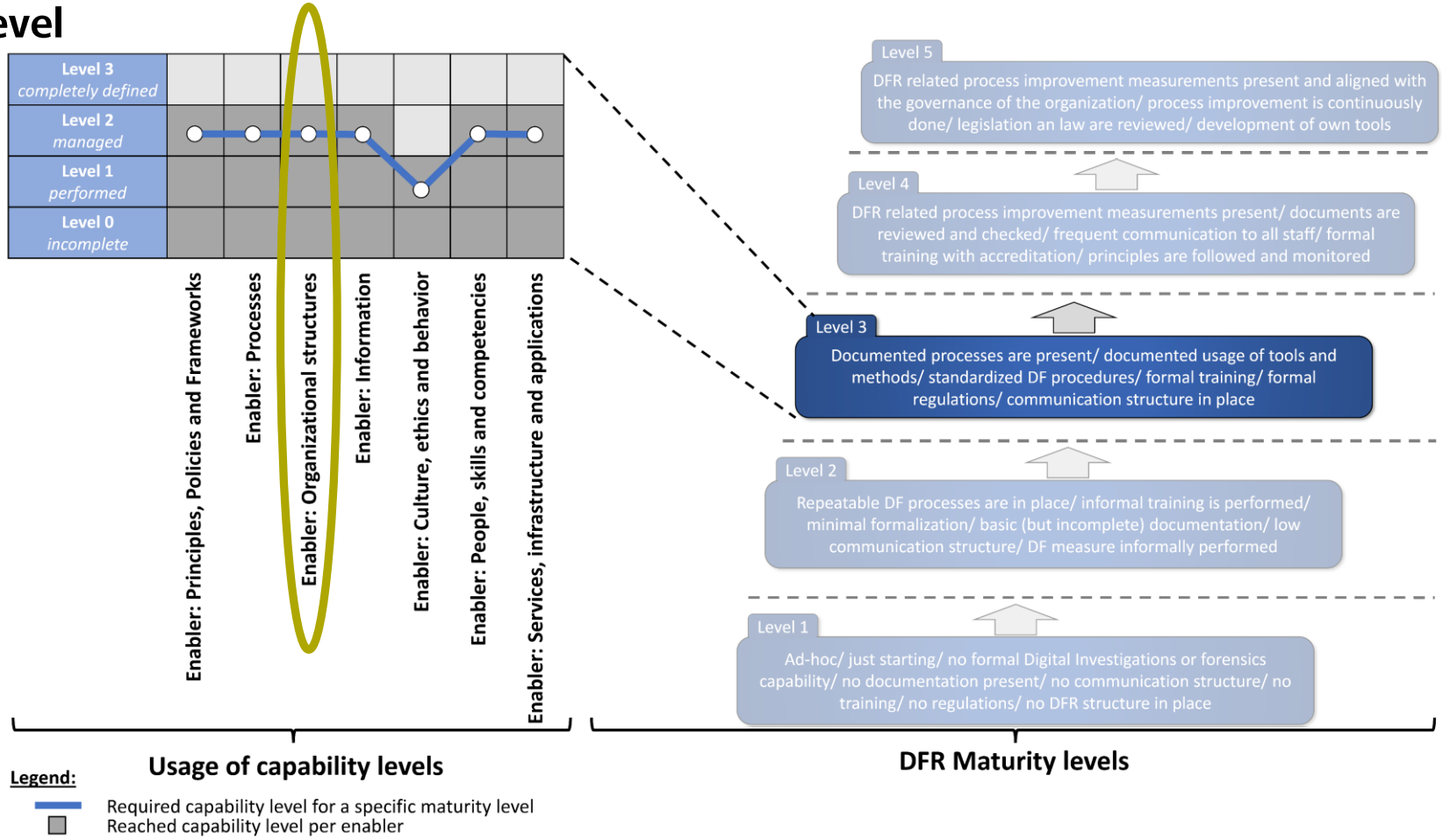
How to implement Digital Forensic Readiness – Example

Step 4: A specific set of capability levels per Enabler defines a specific maturity level



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How to implement Digital Forensic Readiness – Example

Indicators to determine the capability level of the Enabler "Organizational structures"

Indicator	aligned to *enabler*	max. contribution *(cap. level)*	type *m = mandatory o = optional*
Responsibilities for the case of a DF investigation are known	Organizational structures	1	
Responsibilities for the case of a DF investigation are defined	Organizational structures	2	m
DF related decision making guidelines are included in job-descriptions or roles	Organizational structures	3	m
Rights within Information Systems are defined	Organizational structures	1	m
Rights within Information Systems are defined and adjusted to prevent potential destroying or tampering of evidences	Organizational structures	2	m
Identity management system is in place	Organizational structures	3	o
Escalation rules are defined	Organizational structures	2	m
Escalation rules are defined, reviewed and monitored	Organizational structures	3	m

Presence of this indicator is mandatory to reach level 1

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How to implement Digital Forensic Readiness – Example

Level 3

Documented processes are present/ documented usage of tools and methods/ standardized DF procedures/ formal training/ formal regulations/ communication structure in place

- **The minimal necessity to have DFR in place is the maturity level 3**
- **The higher levels, Level 4 and 5, assist to set up necessary requirements to faster adopt new demands in DFR**
- **The model can be used for continuous improvements in specific areas and to stay digital forensic ready**

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Current state of research

- **Further evaluation of the DFR capability maturity model by using a interactive web tool for self-assessment and conducting expert interviews.**
- **Define enterprise forensics as a new academic field of research.**
- **Integration of business process descriptions into enterprise forensics investigations.**
- **Create methods and tools for the investigation of application systems on the application systems abstraction layer.**

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Any questions?

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