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Research on Conformity
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Sicherheit in Technik und Chemie

2022

Digitalization in Conformity Assessment in North Macedonia

A QI-FoKuS study

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A study conducted within the framework of the QI-FoKuS initiative



Basic statistical population for the survey	200 accredited conformity assessment bodies (CABs) in North Macedonia
Data collection method	Online survey
Survey period	October 1, 2022 November 6, 2022
Sample	29 fully completed questionnaires (15% response rate)

Digitalization in Conformity Assessment
Online Survey

QI-FoKuS
Research on Conformity Assessment and Safety

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The Study - An Overview



The digital transformation of the economy as well as increasingly networked and complex products and applications are bringing digitalization into the focus of conformity assessment bodies (CABs). Innovations, new technologies and processes rely on corresponding conformity assessment services. This poses new challenges for testing and calibration laboratories, inspection and certification bodies, and other CABs. At the same time, however, new digital technologies and applications also offer new opportunities. This study is the first to comprehensively explore "Digitalization in Conformity Assessment" building on data from an online survey of accredited CABs in North Macedonia.

Major topic areas covered:

Digital Maturity Level

- Assessment of the digital maturity of the CABs in North Macedonia based on a tailored digital maturity model

Drivers, Benefits and Barriers

- What motivates CABs to transform digitally, what impact do they experience, and what hurdles must be overcome

Technology Trends

- Assessment of the digital technologies and applications currently in use (now and in a 5-year perspective)

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The Sample

General information about the participating Conformity Assessment Bodies

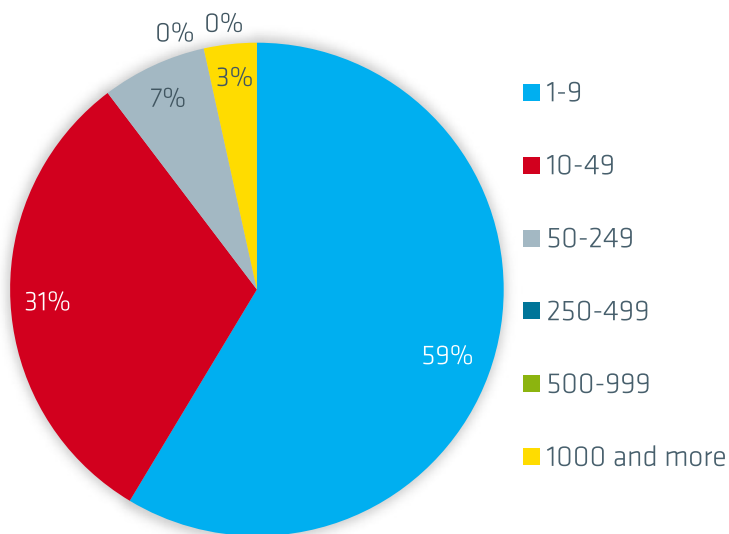
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29 conformity assessment bodies (CABs) in North Macedonia participated in the survey

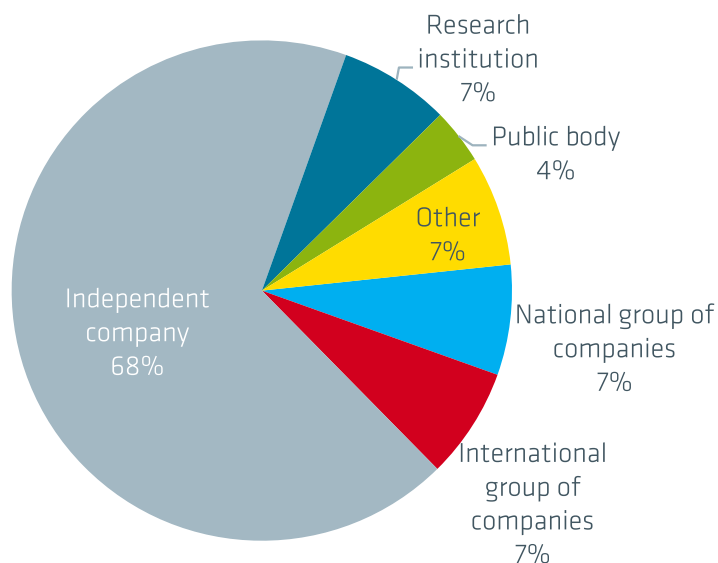


- 90% of participating CABs are **small businesses** with less than 50 employees.
- 68% are **independent companies**, 7% belong to an **international group**, 7% belong to a **national group**.
- for 39% CA is the main **focus of activity** and for 29% it is **one activity among others**.

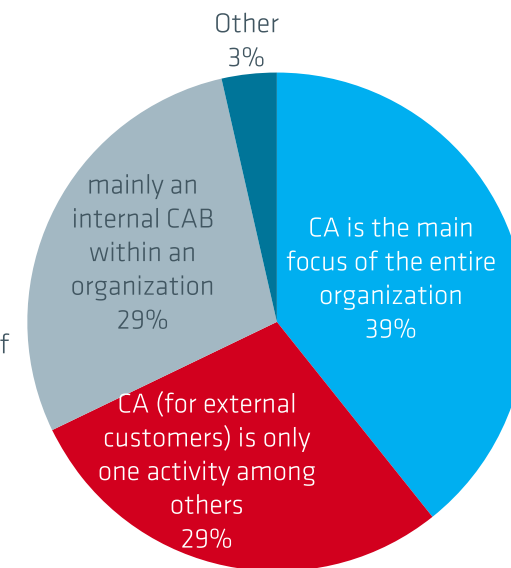
Number of employees (n=29)



Type of organization (n=28)

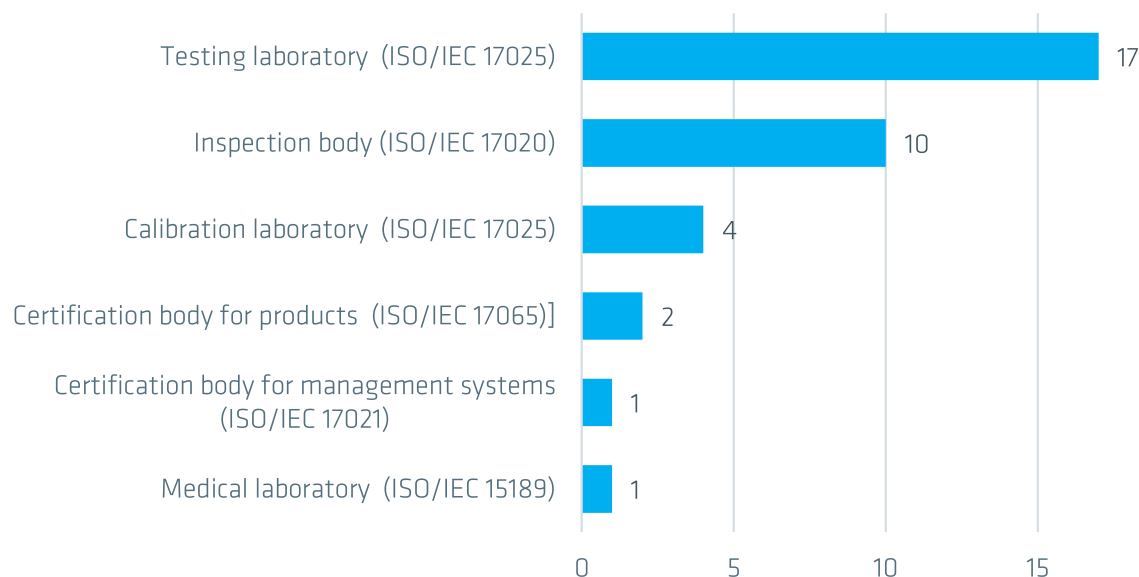


Role of CA for the organization (n=28)

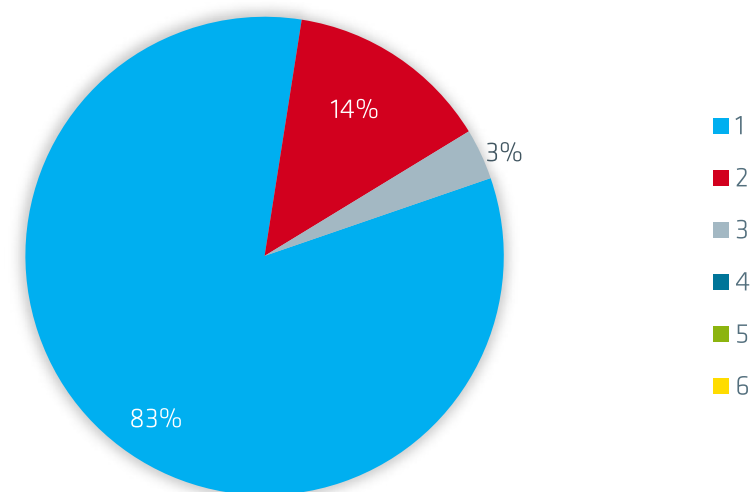


The 29 participating CABs cover a broad range of activities

Field of activity



Number of fields of CA activities per CAB

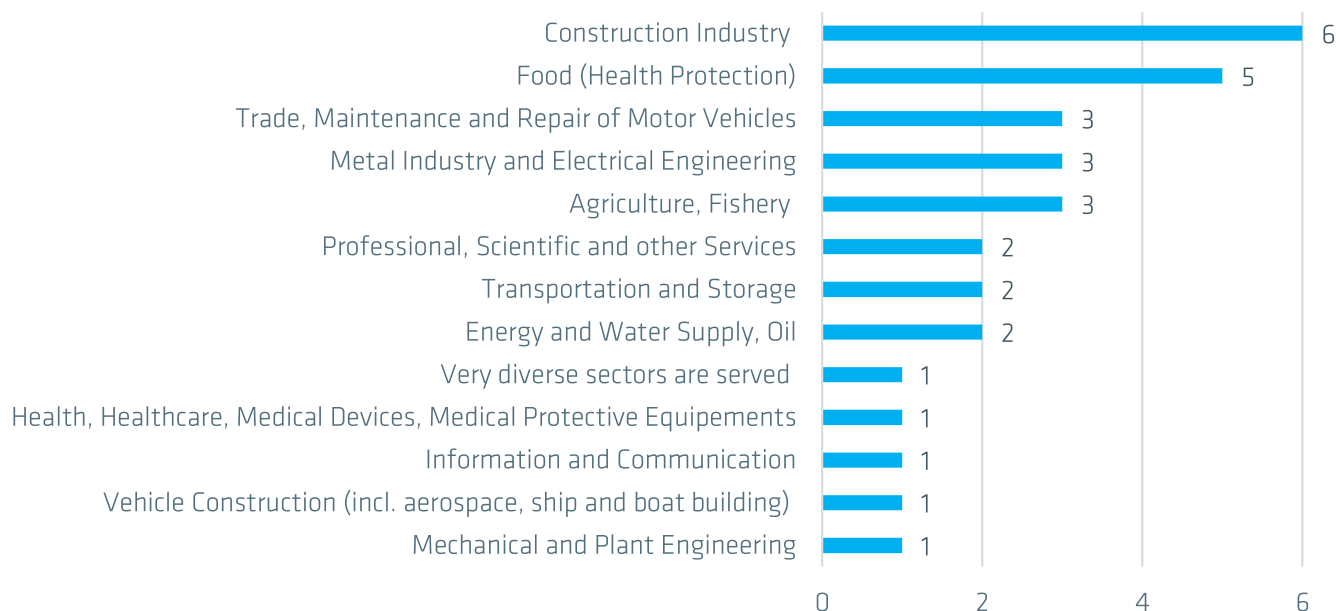


- Testing laboratories represent the **largest group of participants**, followed by inspection bodies and calibration laboratories.
- 83% of CABs are **specialized** in a single field of conformity assessment activity; only a few cover a broad range of activities (up to 3).

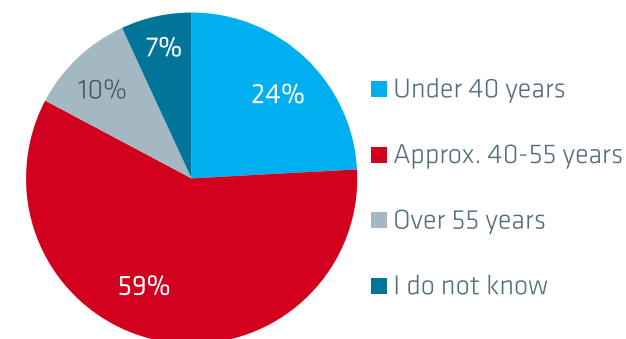
The CABs serve a broad spectrum of sectors



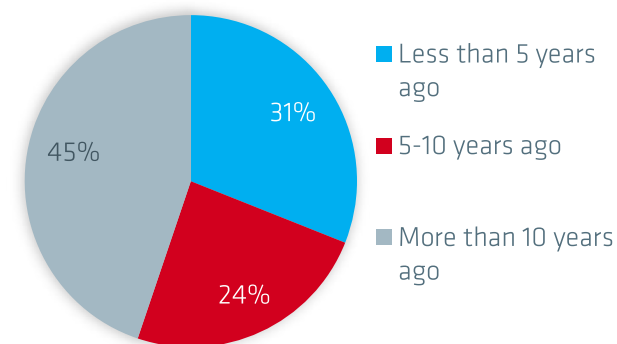
Main sectors served by the CABs



Average age of employees (n=29)



Establishment of the CAB (n=29)



- The **main industries** served by the CABs are from the construction industry, but the food sector is also important.
- While the **average age of the employees** is 40-55 years in 59% of the CABs, 24% have staff under 40 years on average.
- 45% of the CABs were **established** more than 10 years ago; one third is younger than 5 years.

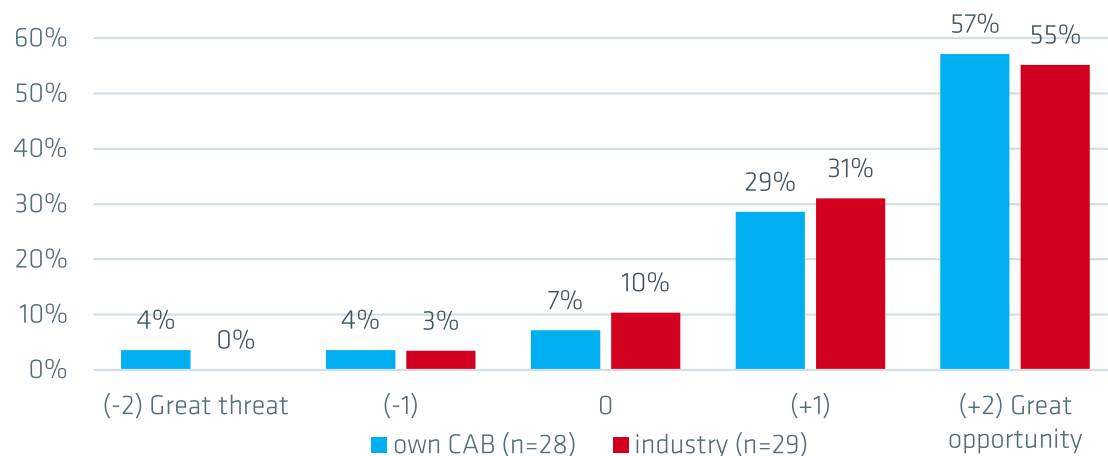
Digitalization in North Macedonian CABs A General Overview

This section sheds light on how the participating CABs perceive digitalization for their organization (now and in perspective) and how they self-evaluate their current state of digital transformation.

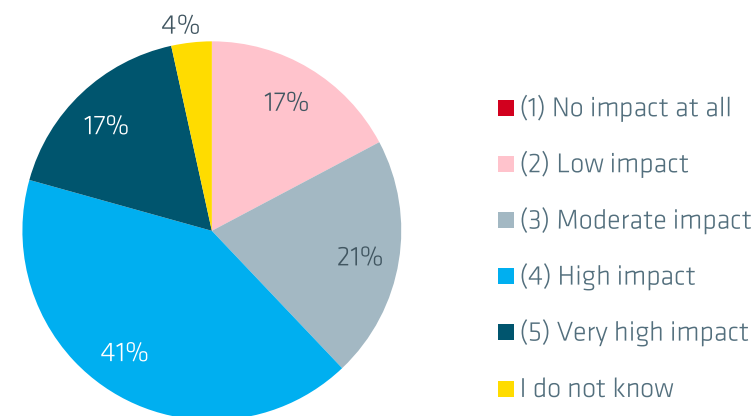
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Digitalization is perceived as an opportunity by most CABs, with high impact in the future

For the CAB itself and the whole industry, digitalization is viewed rather as...



Expected impact of digitalization in the next 5-10 years (n=29)

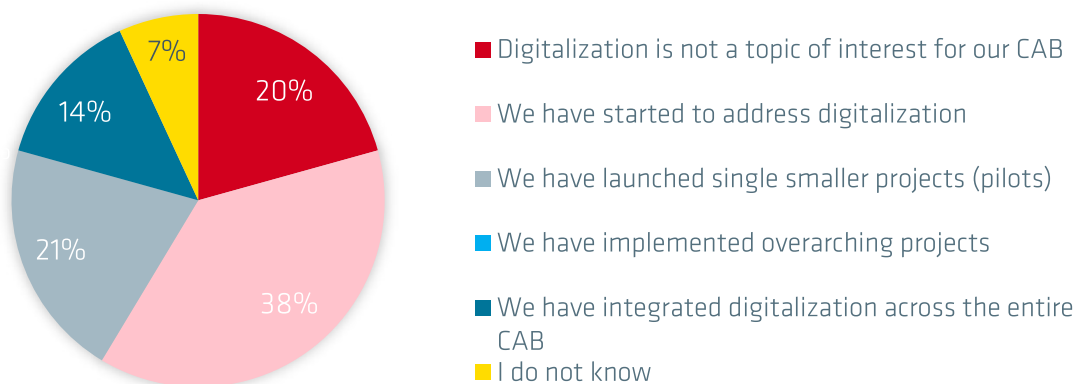


- In general, the CABs have a **positive perception** of digitalization: 86% of surveyed CABs recognize digitalization as an **opportunity or even a great opportunity** rather than a threat, for the own organization and even 86% for the whole CA industry.
- 58% of the participants expect a **high or even very high impact of digitalization on CA activities** in the next 5-10 years.

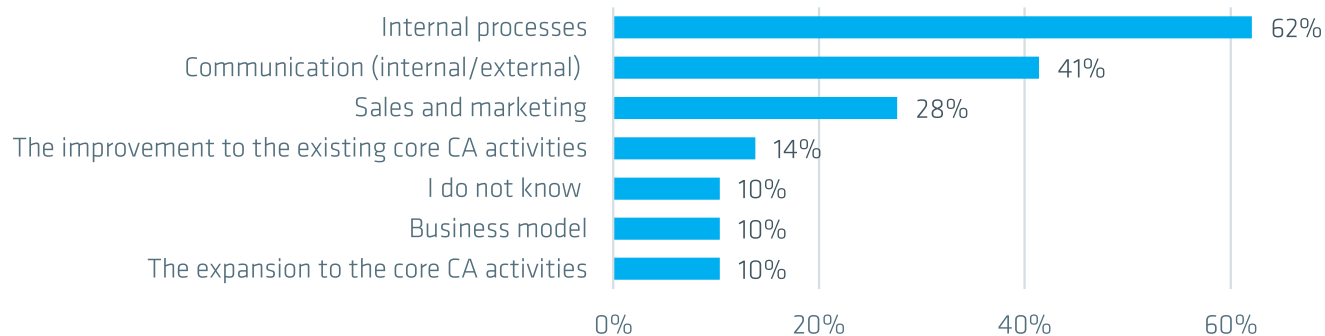
Diverse status of digitalization across the CABs//

Focus mainly on internal processes

Status and extent of digitalization in the CABs (n=29)



Areas targeted by digitalization (multiple answers possible, n=29)

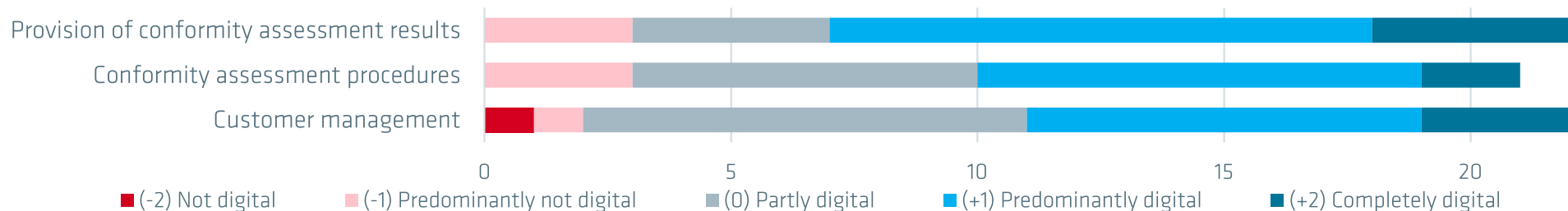


- **The status of digitalization is quite diverse** across the CABs in North Macedonia: While 38% of the CABs have just started to address this topic, 21% have launched single smaller projects and no CAB has already implemented overarching projects. 14% state to have integrated digitalization across the whole organization.
- Although most of the **digitalization activities concern internal processes**, digitalization is currently used by 41% of the CABs to target communication. However, it is rarely used to adopt new business models or to expand core CA activities.

Many areas are only partly digital; CABs yet rate themselves more digital than their stakeholders

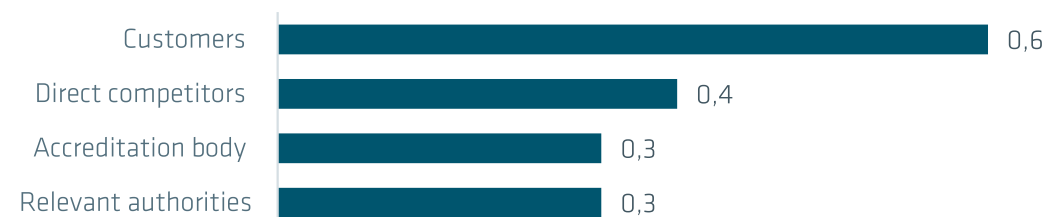


Self-evaluation of the CABs' status of digitalization in different areas (n=23)

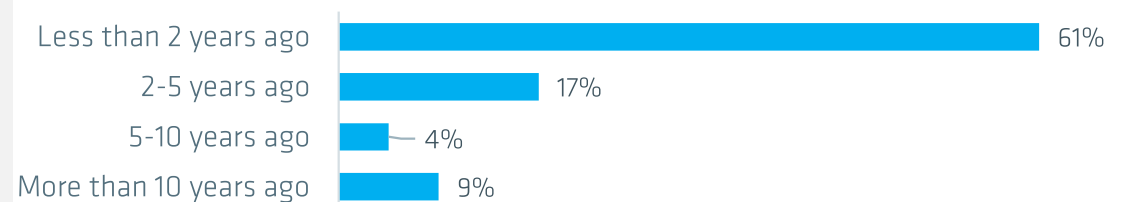


- The CA results are provided partly, predominantly or completely digitally by the majority of CABs. Customer management are less frequently digitalized.
- When **comparing themselves to other organizations**, CABs perceive their digital status as at least as good or better, especially when compared to customers and direct competitors.
- 78% of the CABs **have started to deal with digitalization** recently (during the last 5 years). Only 9% have done so at least 10 years ago.

Own status of digitalization compared to... (n=28)
(on a scale of (-2 much worse) to (+2 much better))



CABs started to deal with digitalization... (n=23)



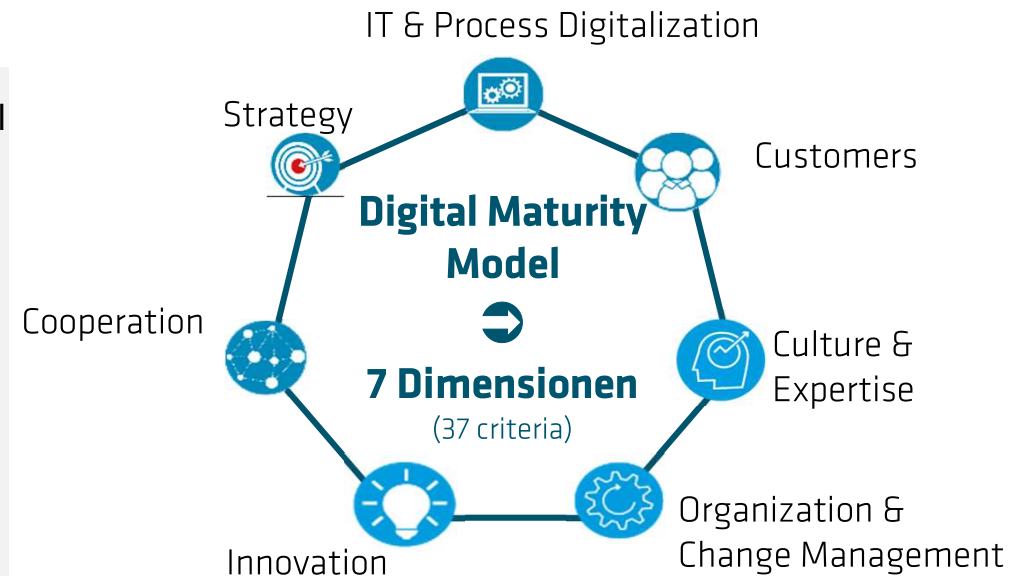
Digital Maturity of CABs

The "digital maturity" of an organization describes its status in the digital transformation. Digital maturity models use predefined dimensions and criteria to assess the ability of organizations to cope with the digital transformation. The following chapter presents the results for CABs in North Macedonia based on a model developed specifically for this study.

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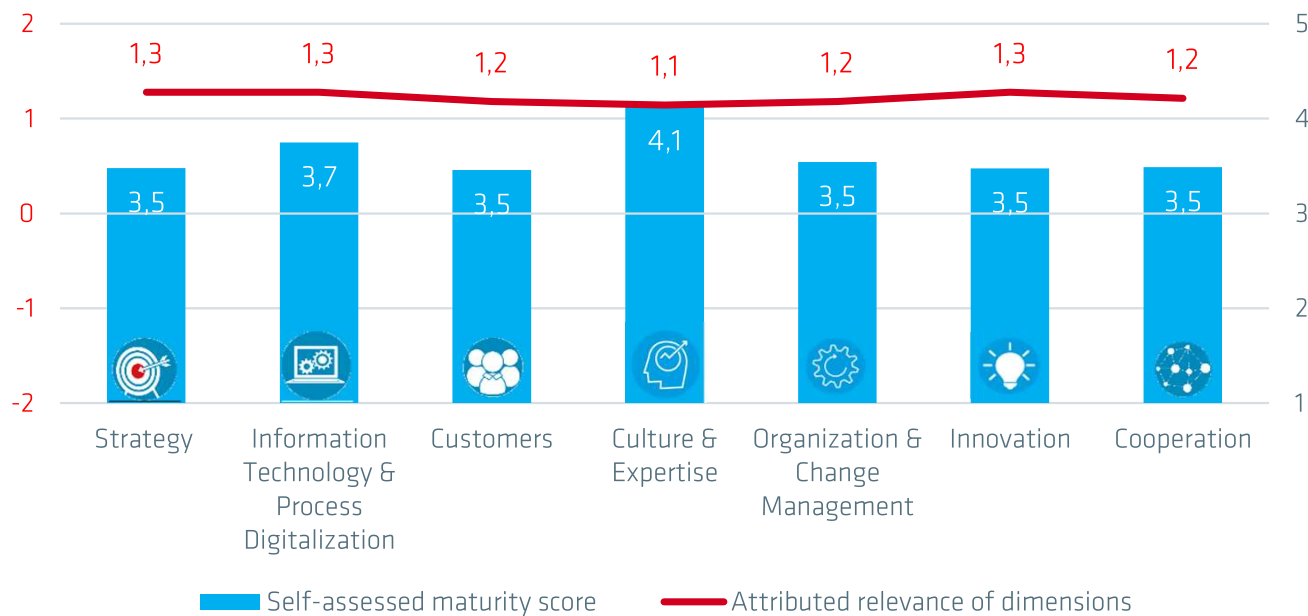
The digital maturity model for the conformity assessment industry

- The digital maturity level reflects the status of the digital transformation of an organization and includes technical as well as organizational and strategic aspects.
- Becoming a digitally mature organization requires efforts, **capabilities** and **resources** across many areas.
- These are mapped in a maturity model using various **dimensions** and **criteria**:
 - Our specially developed model takes into account 7 dimensions that are essential in the digital transformation of CABs: from technological to strategic, organizational, to cultural aspects.
 - Each dimension is operationalized by 4 to 6 criteria that describe basic success factors in terms of capabilities, capacities and resources.
- By means of a self-assessment of the participating CABs along these criteria, an individual digital maturity level is calculated - from level 1 ("beginner") to level 5 ("expert").



Different maturity of dimensions: culture and technology advanced

Self-assessed along the relevant dimensions and assigned relevance



* CABs were asked to self-evaluate along statements in 7 topic areas (dimensions) on a scale from 1 (I do not agree at all) to 5 (I fully agree). These statements and dimensions are displayed in detail in the following pages. Participants were then asked to rate the importance of each dimension with regard to a successful digital transformation on a scale from -2 (not important at all) to +2 (very important).

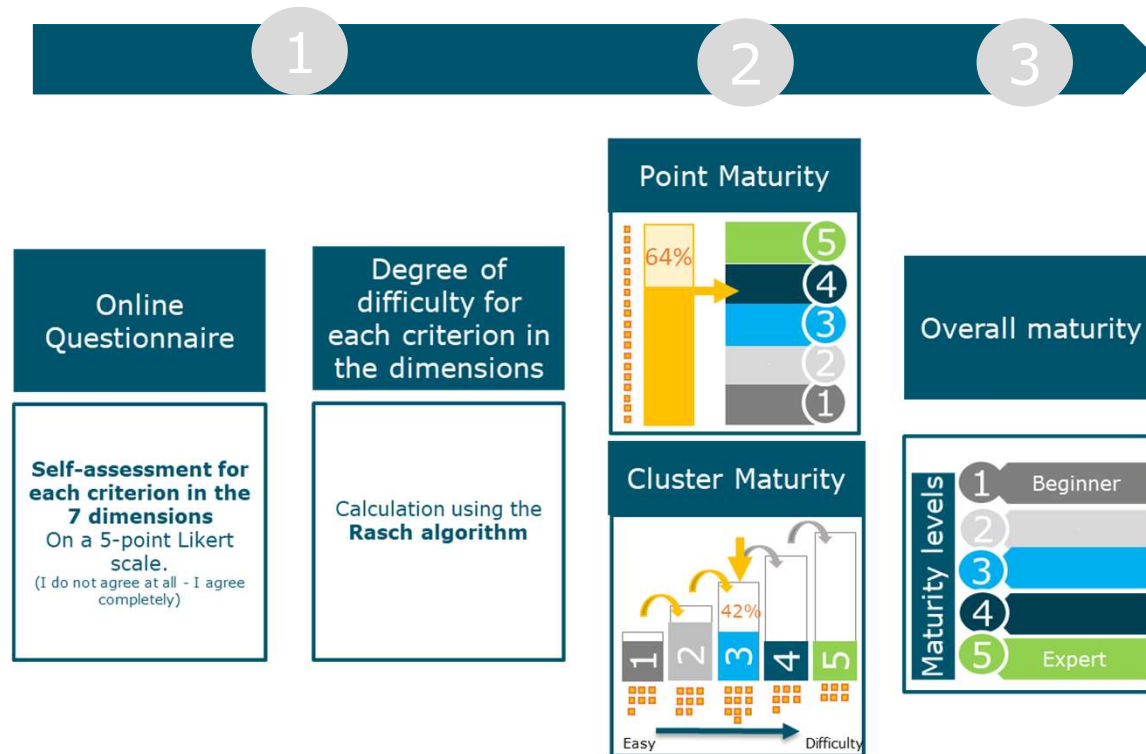
- The results of the maturity model show a difference in the average status of the CABs in the various dimensions:
 - The CABs consider themselves to be **most advanced** in the areas of “Culture and Expertise”, followed by “Information Technology & Process Digitalization”.
 - CABs consider to be less digital matured in the other areas.
- Respondents are aware of the high relevance of the IT dimension as well as the strategy and innovation dimensions.

➔ *Details on the composition and partial results in the individual dimensions can be found in the appendix.*

Background information: Calculation of the digital maturity level

In the questionnaire, participants indicate the extent to which each of the criteria in the 7 dimensions applies to their CAB. In a **multi-stage process**, digital maturity is determined on the basis of these assessments:

1. For each criterion, the Rasch algorithm is first used to calculate how difficult it is to achieve a good result for it (**degree of difficulty**). If, on average, a large number of participants state that they can meet this criterion, it is classified as easy to achieve.
2. Based on this, 2 types of maturity levels are determined: **Cluster analysis** is used to divide the indicators into 5 sequential maturity clusters (1 = easiest indicators; 5 = most difficult). To reach higher maturity, the thresholds of the lower maturity levels have to be met first. In addition, the **point maturity** is calculated: Here, the achieved points count in comparison to the possible total points.
3. The **overall digital maturity score** is the average of the cluster and point maturity scores.

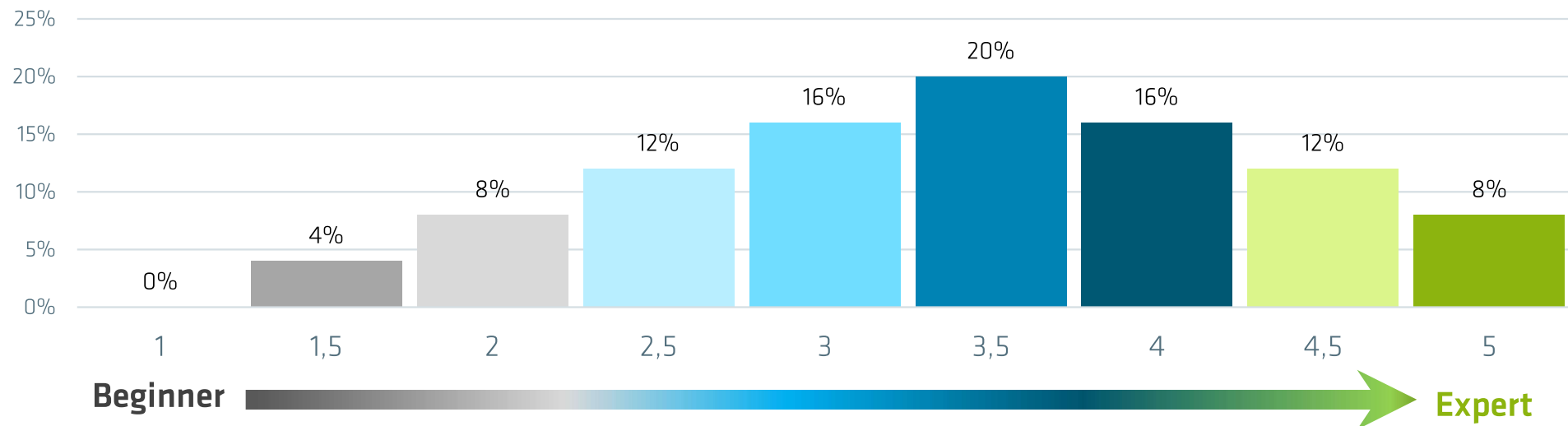


The calculation is based on the method of the St. Gallen maturity model. See Back & Berghaus (2016). Digital Maturity & Transformation Study; Berghaus & Back (2016). Stages in Digital Business Transformation; and Friedel & Back (2012). Determination of enterprise 2.0 development levels with a maturity model.

Overall Digital Maturity Scores of the North Macedonian CA industry



Distribution of overall maturity scores (n=29)



Statistically, the **digital maturity levels** achieved by the 29 participating CABs in North Macedonia follow a right-skewed *normal distribution*:

- 36% of the CABs have reached medium level 3 (i.e., 3 and 3,5) and the same number of CABs have already reached a higher level of maturity.
- 24% of CABs are still in the earlier stages of transformation, however no CAB is still on the very beginner level. 8% of the CABs have yet achieved the expert maturity stage 5.

The 5 Digital Maturity stages in CABs in North Macedonia

Expert

5

Beginner

1

- ✓ Openness to change
- ✓ Digital transformation is important

2

- ✓ Central role of digitalization in overall strategy
- ✓ Documented digital strategy
- ✓ Automated routine processes
- ✓ Networked processes through IT
- ✓ Impact of new digital technologies on CA
- ✓ IT usage reliably ensured
- ✓ IT security: awareness and compliance
- ✓ Availability of right people and skills
- ✓ Risk of failure accepted
- ✓ Targeted training
- ✓ Digital activities integrated into core processes
- ✓ Digitalization as a new source of value creation
- ✓ Collaboration across departments
- ✓ Exchanges with external experts

Intermediate

3

- ✓ Evaluation of digital technologies with regard to innovation potential
- ✓ Customer interactions via digital channels
- ✓ Integrated, digitalized customer care
- ✓ Customer data analyzed
- ✓ Defined roles, responsibilities & decision-making processes

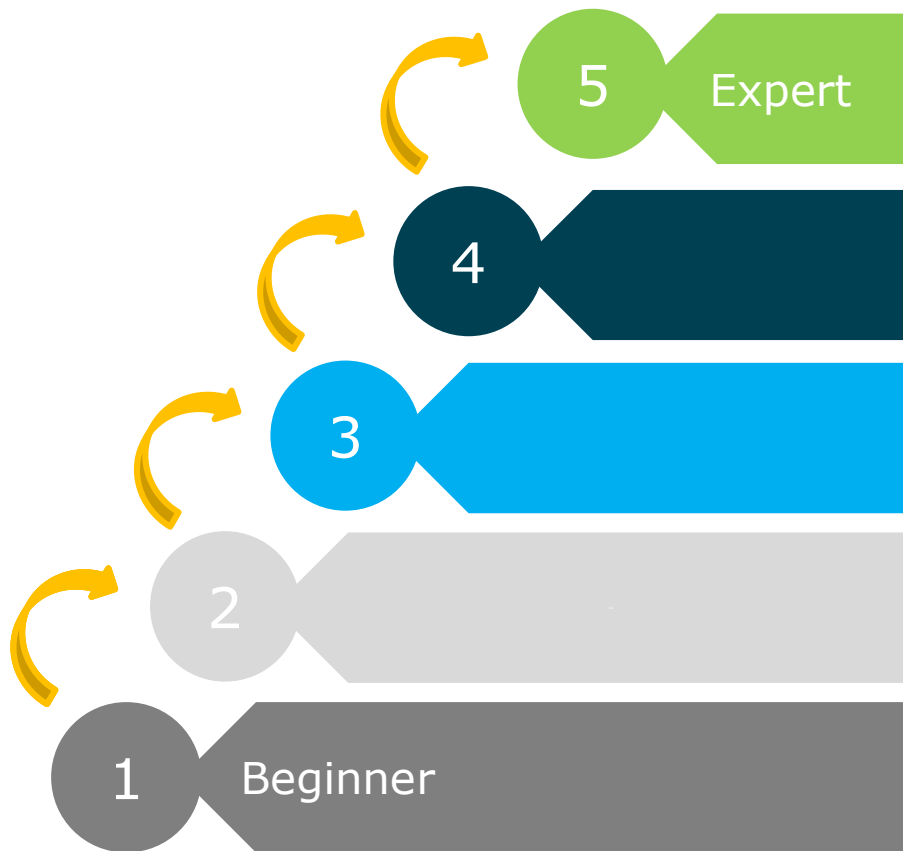
4

- ✓ Clear responsibilities for digitalization goals
- ✓ Investments in digital technologies
- ✓ Measurable goals
- ✓ Innovations driven forward systematically and purposefully
- ✓ Customers involved in development of digital innovations
- ✓ Clearly defined innovation process
- ✓ Competitive advantages through digitalization
- ✓ Effective collaboration with stakeholders
- ✓ Effective internal collaboration

5

- ✓ Key indicators to measure the implementation of the digital strategy
- ✓ Digital Roadmap
- ✓ Digital solutions based on customer needs
- ✓ Early warning system to identify relevant digital technologies and business models
- ✓ Rapid response to change
- ✓ Sufficient resources to drive digital innovations
- ✓ Partner network with external providers

The Digital Maturity of CABs in North Macedonia // Summary of the observed patterns



- At the **first maturity level**, CABs are open to new technologies, change, and transformation.
- For **stage two**, capabilities, resources, and capacities are activated in all dimensions, with a focus on IT & process digitalization. Most important technologies are known and routine processes are automatized.
- Organizations, that have reached the **third maturity level**, focus on Customers. Customer needs and analyses increasingly come into focus.
- In the **fourth maturity stage**, innovation is shifting into focus, both, on a strategic and systematic level to generate competitive advantages. There is intensive collaboration, in particular through the establishment of internal collaboration as well as collaboration with stakeholders, the involvement of customers, and clear innovation processes.
- The final **fifth stage**, key indicators for measuring the implementation of the digital strategy and Digital Roadmaps are adopted. Digital solutions are based on customers needs. Warning systems are in place to identify relevant digital technologies and targeted partner networks are established.

Motives, Impacts and Hurdles of Digitalization

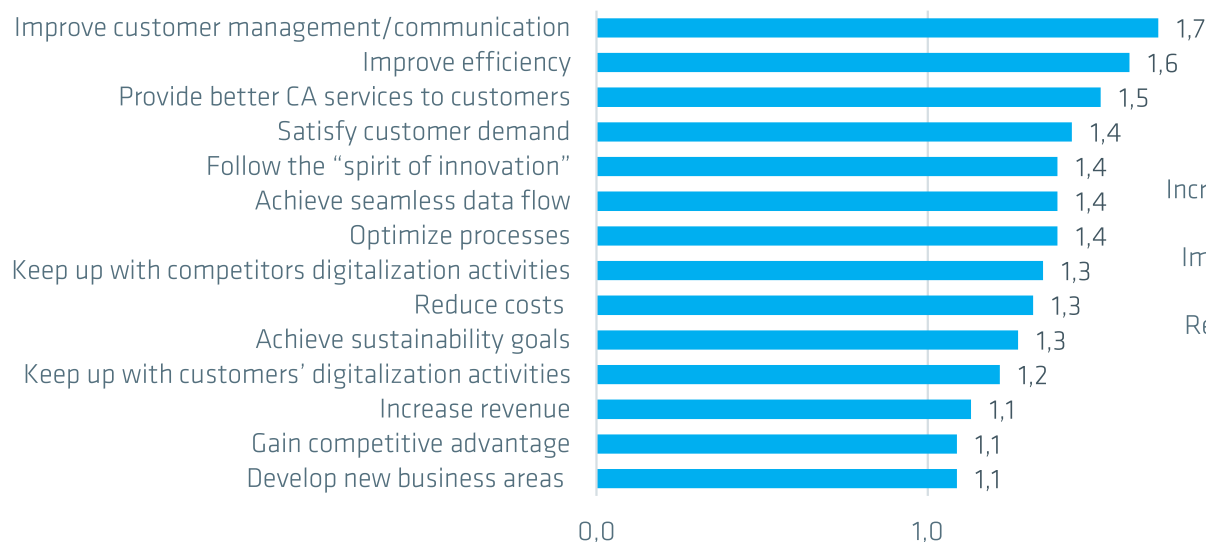
What drives digitalization in North Macedonian CABs? What effects can be achieved for the organizations? Are expectations being met? And what are the biggest hurdles to overcome in the digital transformation?

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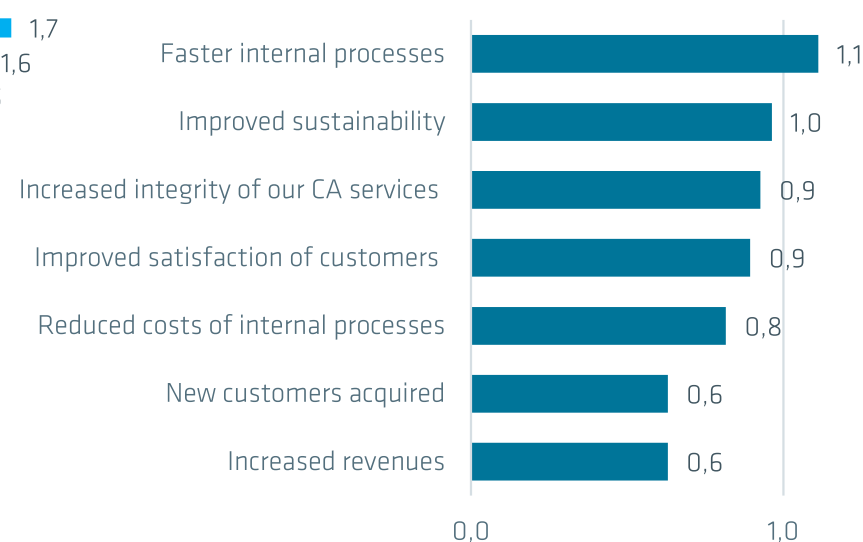
Focus on process optimization and efficiency enhancement



Goals behind the digitalization efforts (n=23)
(on a scale from (-2) does not apply at all to (+2) fully applies)



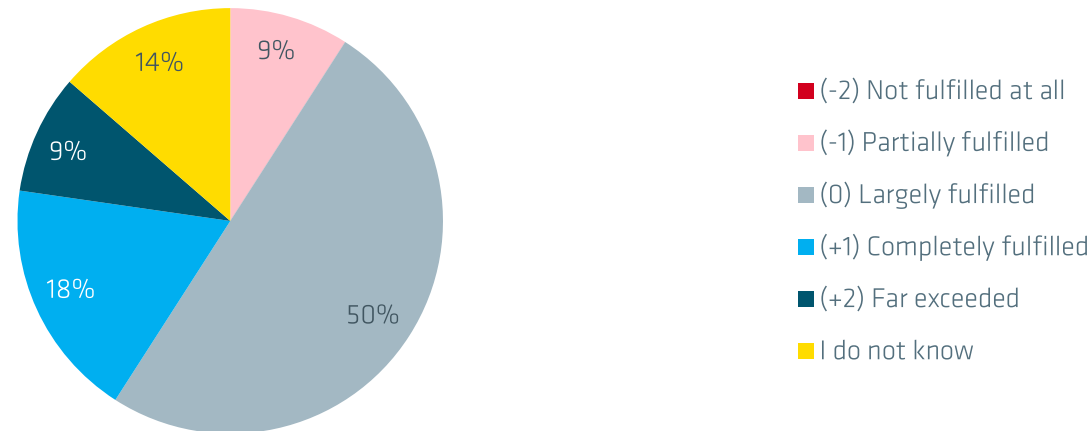
Benefits realized from digitalization (n=28)
(on a scale from (-2) not agree at all to (+2) fully agree)



- Improving customer management/communication and efficiency are the **main goals** behind the digitalization efforts of CABs in North Macedonia. In fact, faster internal processes and improved satisfaction of customers and improved sustainability are among the greatest realized benefits.
- Market objectives such as increasing revenues or keeping up with competitors digitalization activities are not big drivers - and the effects achieved on new customer acquisition and increased revenues are correspondingly low.

CABs' expectations in connection with digitalization are mostly largely met

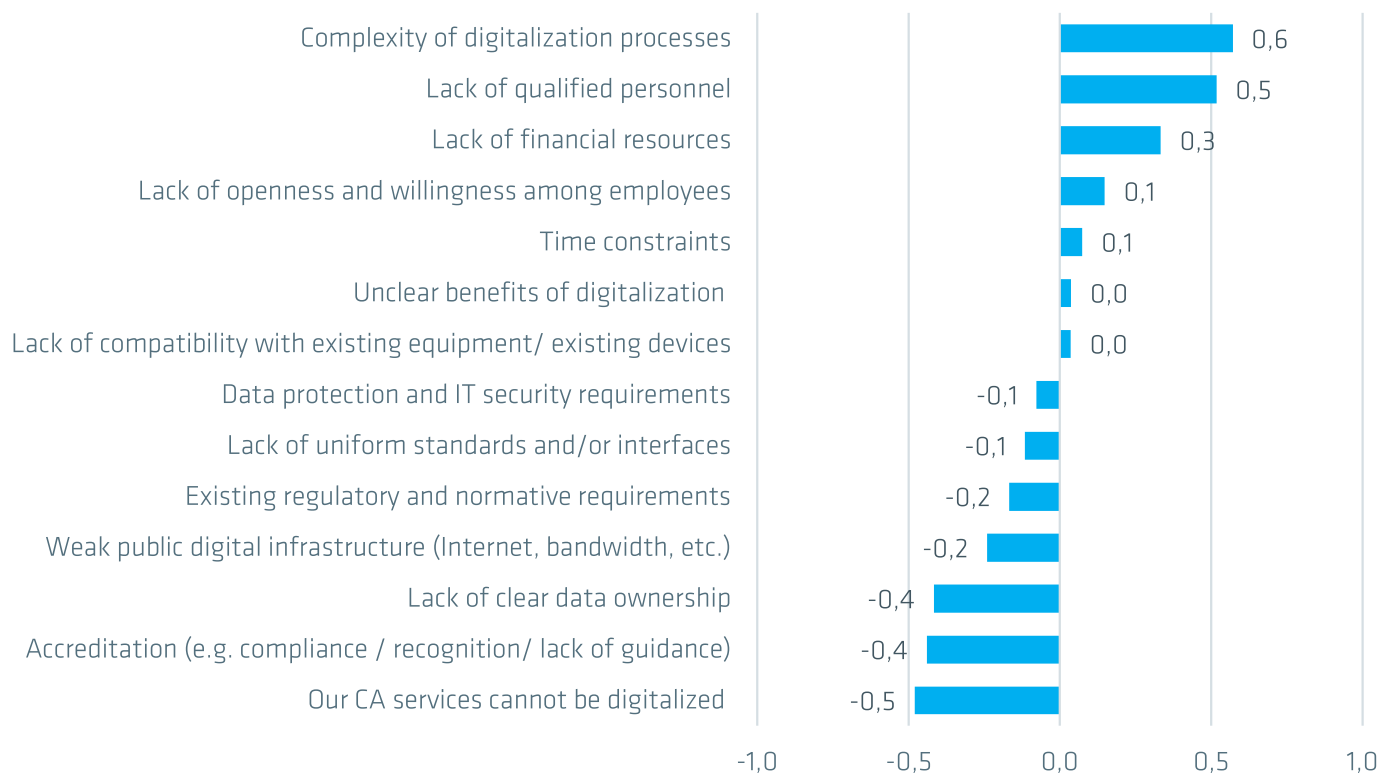
Whether the expectations behind the introduction of digital processes/technologies have been fulfilled overall so far (n=22)



- Every second CAB states that their expectations of the introduction of digital technologies have been largely fulfilled. For 27% they have been partially or completely fulfilled.
- For 9% of the CABs the expectations are only partially fulfilled.

Complexity of digitalization processes is the main hurdles to digital transformation

Hurdles to digital transformation (n=28)
(Scale from (-2) not at all to (+2) very much)



- The general complexity of digitalization processes is the biggest hurdle for CABs, followed by the lack of qualified personnel and financial resources.
- The lack of openness and willingness among employees and time constraints are also considered obstacles.

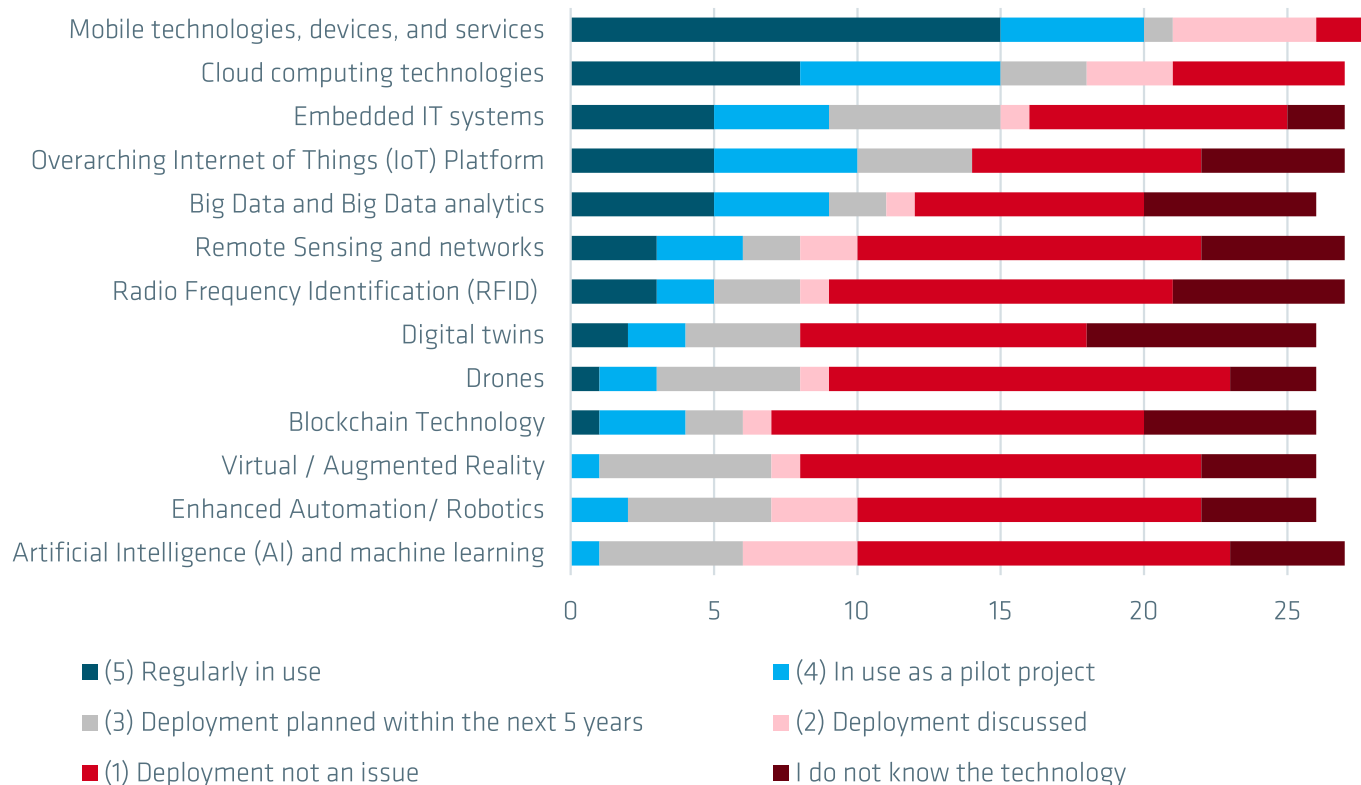
Technologies and Trends

This section highlights the actual (or planned) use of concrete digital technologies and applications in the CABs. In addition, the use of remote procedures and technologies is presented.

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Latest digital technologies are not yet widely used in CABs

Technologies that are used or planned to be used (n=28)

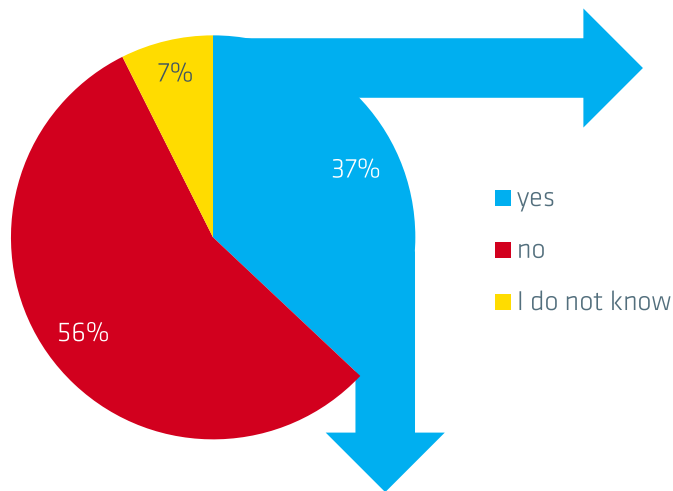


- Many of the latest digital technologies such as Big Data, remote sensing, digital twins, drones and blockchain technology are used by CABs in North Macedonia, but not yet on a large scale.
- Blockchain technologies mean nothing to 23% of the respondents, digital twins to 31%.
- Among CABs, mobile technologies are widely used, followed by cloud computing technologies and embedded IT systems.

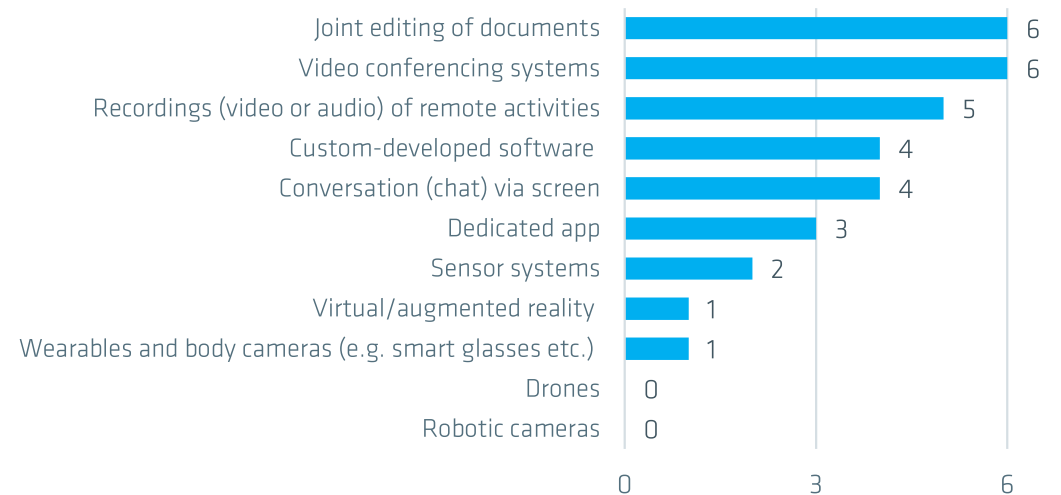
Remote methods and technologies are not largely used by most CABs



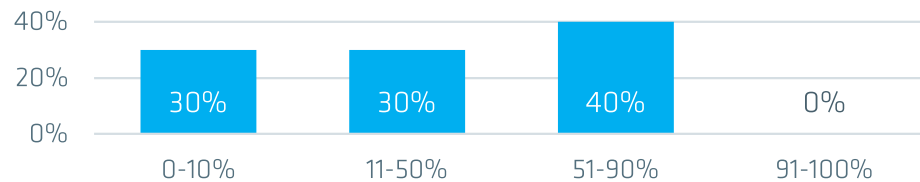
CABs that use remote methods in CA (n=27)



Technologies used for remote procedures (n=10)



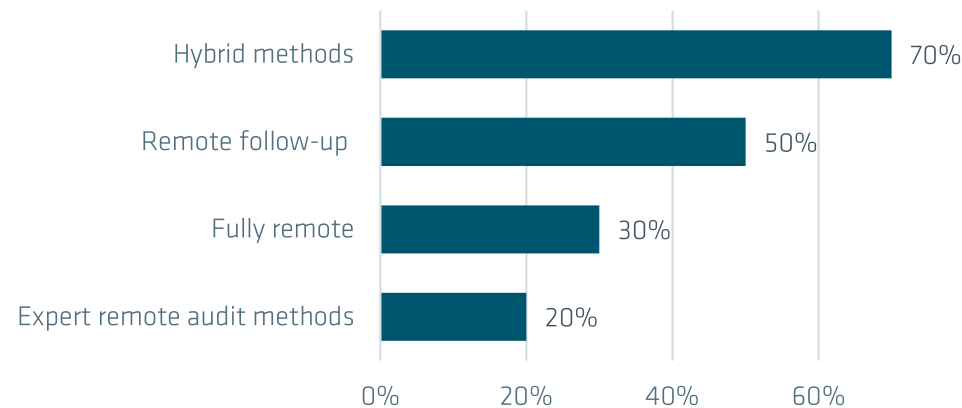
Share of CA services taking place remotely (n=10)



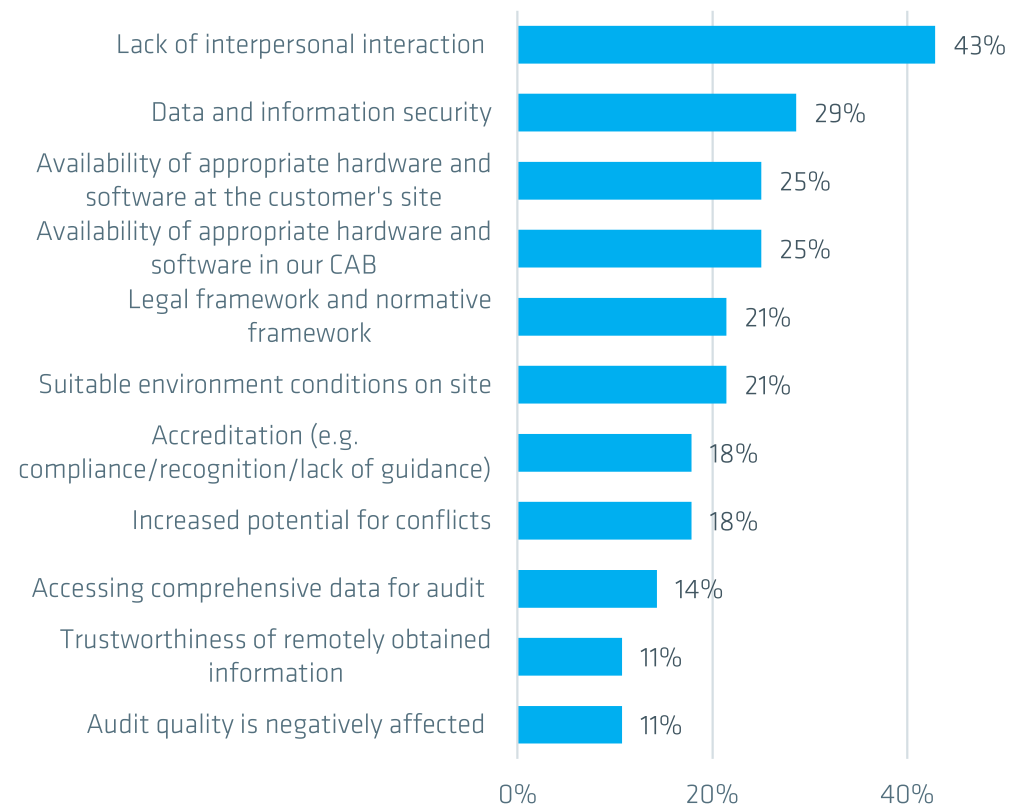
- 37% of the CABs use **remote methods** in their CA activities.
- 30% of the CABs still perform a maximum of 10% of their activities remotely. No CAB has already switched completely.
- Joint editing of documents and video conferencing systems are the most commonly used **tools for remote working**.

Diverse approaches used and experienced hurdles in remote procedures

Type of remote procedures used (n=10)



Barriers (n=28)

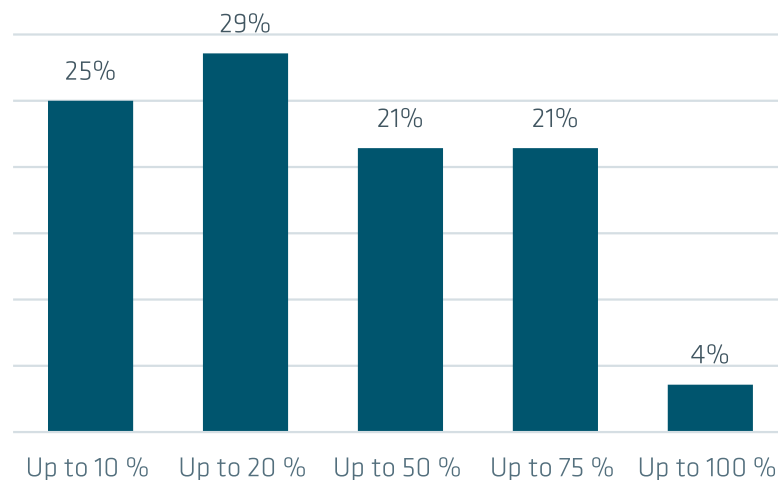


- **Hybrid methods** are the predominant type among remote methods used by CABs.
- Lack of interpersonal interaction is seen as the biggest **hurdle** in the use of remote methods, followed by data and information security and the availability of appropriate hardware and software at the customer's site.

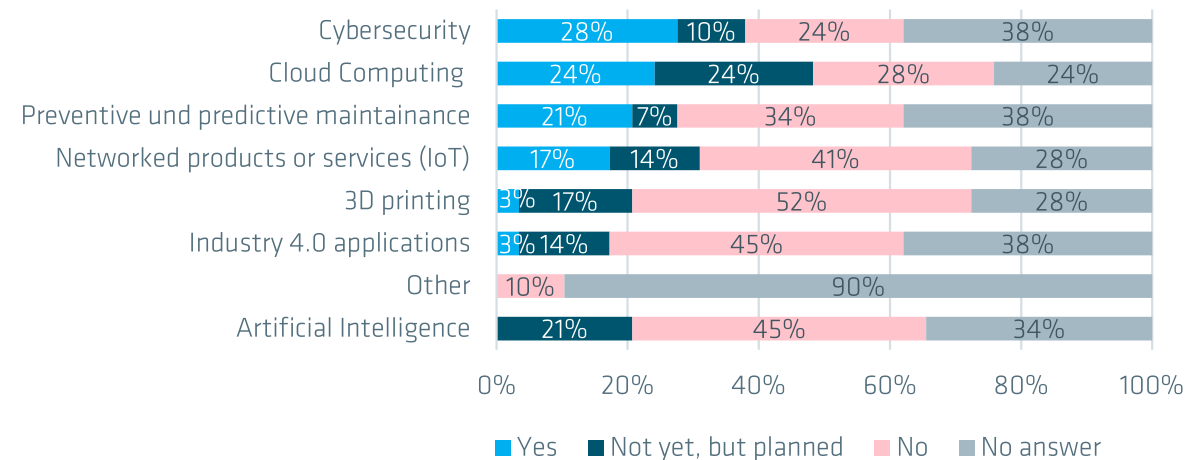
CA for advanced digital technologies is only performed by a minority of CABs so far



Share of routine processes that are digital (n=28)



Digital products and applications for which CA is conducted (n=28)



- One in four CABs has digitalized more than half of its **routine processes**. However, the same number of CABs have not even digitally converted 10% of their processes.
- Only 35% of the surveyed CABs conduct conformity assessments for modern digital technologies and applications. In focus: cybersecurity (28%) and cloud computing (24%).

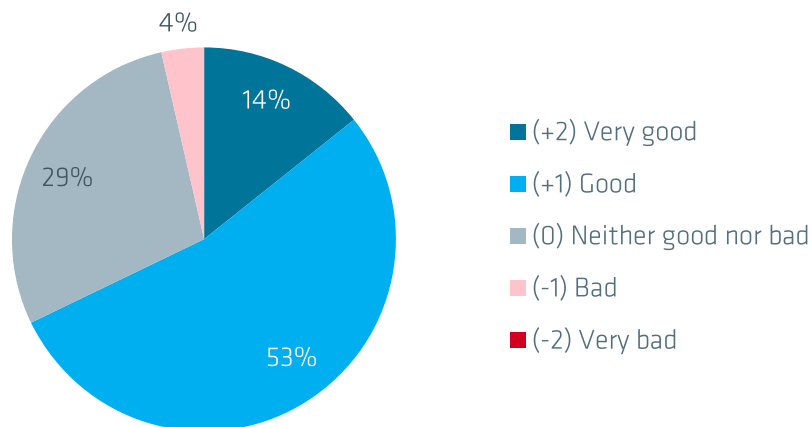
The COVID-19 Pandemic and Digitalization

The role of digitalization in responding to the challenges posed by the COVID-19 pandemic and the impact of the pandemic on digitalization.

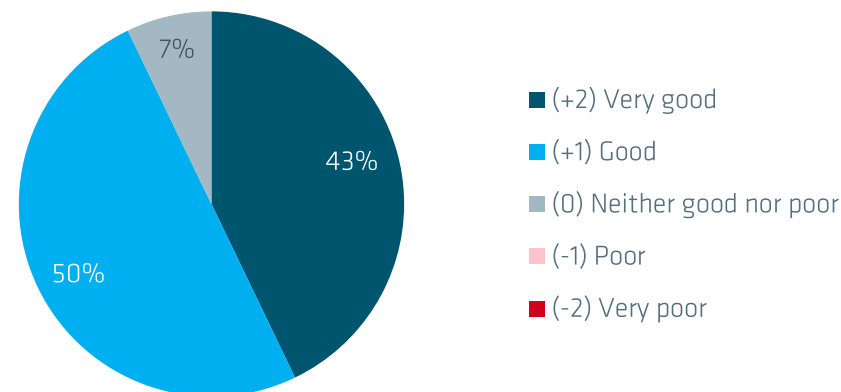
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Most CABs coped well with the COVID-19 pandemic

CABs' order situation in 2021 compared to pre-COVID-19 times (n=28)



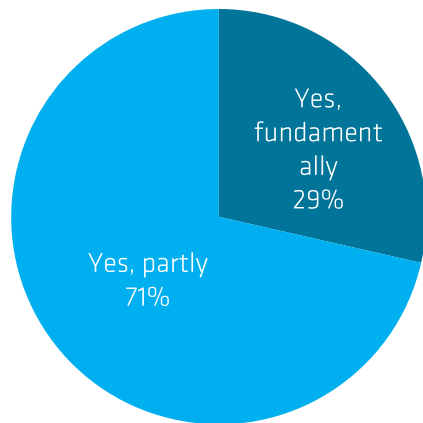
Response to the challenges of the COVID-19 pandemic (n=28)



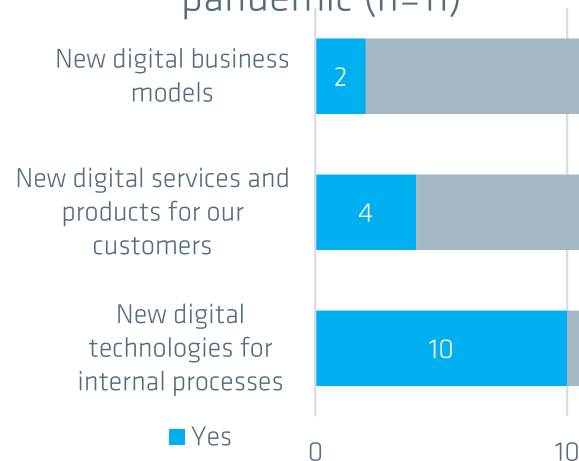
- For 29% of the CABs, the **economic situation** in terms of incoming orders in 2021 was no better or worse than before the pandemic. The majority (67%) has actually seen their order situation improve. 4% of the CABs stated that their orders have declined.
- The majority of CABs (93%) reported that they had responded well or very well to the challenges associated with the COVID-19 pandemic.

Pandemic and digitalization

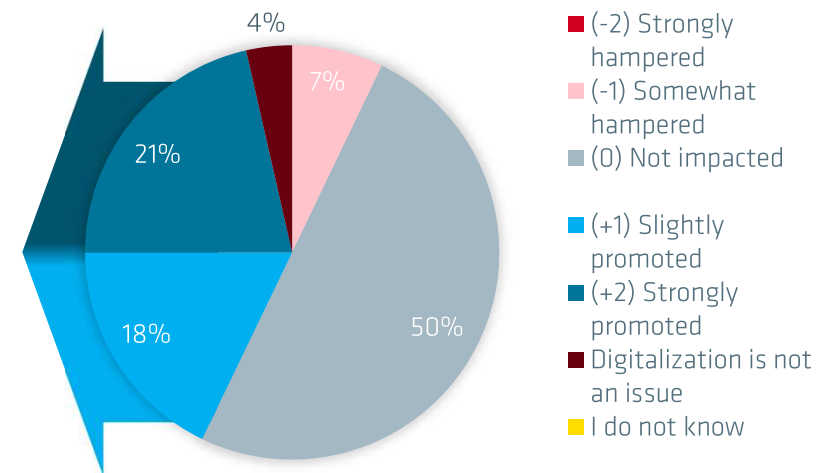
Digital technologies have helped coping with challenges of the COVID-19 pandemic (n=28)



Digital adaptation in course of the COVID-19 pandemic (n=11)



Impact of the Covid-19 pandemic on the digitalization of CABs (n=28)



- All CABs state that digital technologies have helped them address the challenges of the COVID-19 pandemic.
- The majority of the CABs (39%) reports that digital transformation has been slightly or even strongly encouraged and has led to adaptations:
 - 91% of CABs have introduced new digital technologies for internal processes, 36% new digital services and products for their customers, 18% even new digital business models.

Conclusion and Outlook

- CABs in North Macedonia clearly see digital transformation as an opportunity. The **level of digitalization** varies widely. The majority of participants has reached a medium or higher level of digital maturity.
- The **digital transformation process** in North Macedonia shows an initial focus on culture & expertise, with CABs open to new technologies, change, and transformation. This is followed by holistic organizational transformation, including strategy, strong innovation networks, IT and cooperation.
- Many of the **cutting-edge digital technologies** such as Big Data, remote sensing, digital twins, drones and blockchain technology are used by CABs in North Macedonia, but not yet on a large scale.
- With their digitalization efforts, the CABs are primarily aiming at internal process improvements. Routine processes are increasingly being digitalized and there is a switch to - mostly hybrid - remote processes.

North Macedonia in international comparison

How do North Macedonian conformity assessment bodies compare internationally? We have conducted the survey on digitalization in conformity assessment in around 20 other countries. The individual country reports and a final comparative study will be published step by step on our website. Articles and an extensive report with further detailed analyses are also planned.



➔ www.qi-fokus.de



This study was developed in the context of the QI-Digital initiative. Its goal is to develop solutions for a modern digital quality infrastructure (QI) - together with stakeholders from business, politics, science, and QI. More information on the initiative and the opportunities for participation can be found at ➔ www.qi-digital.de

The Project and Contacts



Project partners



Supported by



Scientific execution / authors

Dr. Claudia Koch, Dr. Luana Ladu, Parsa Asna Ashari (BAM)

Prof. Dr. Knut Blind (TU Berlin, Fraunhofer ISI)

Prof. Dr. Pavel Castka (University of Canterbury, NZL)

Support: Timo Kabierski



QI-FoKuS stands for **Qualitätsinfrastruktur - Forschung für Konformitätsbewertung und Sicherheit** ("Quality Infrastructure - Research for Conformity Assessment and Safety").

The initiative was launched jointly by BAM and TU Berlin in 2019 and is supported by the Federal Ministry of Economic Affairs and Climate Action (BMWK).

We conduct studies on current and fundamental topics of conformity assessment and accreditation. The studies are based on our comprehensive surveys of companies and in particular conformity assessment bodies in Germany and abroad. By publishing the results, we contribute to an improved database, scientifically sound findings and the identification of trends in quality infrastructure.

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Acknowledgement

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Contact

Bundesanstalt für Materialforschung und –prüfung (BAM)

S.2 Accreditation and Conformity Assessment

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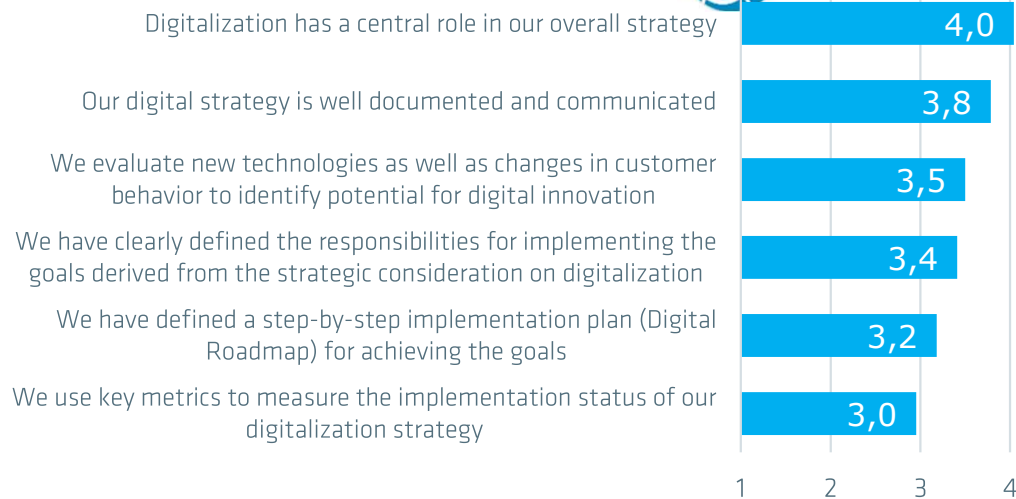
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Annexes

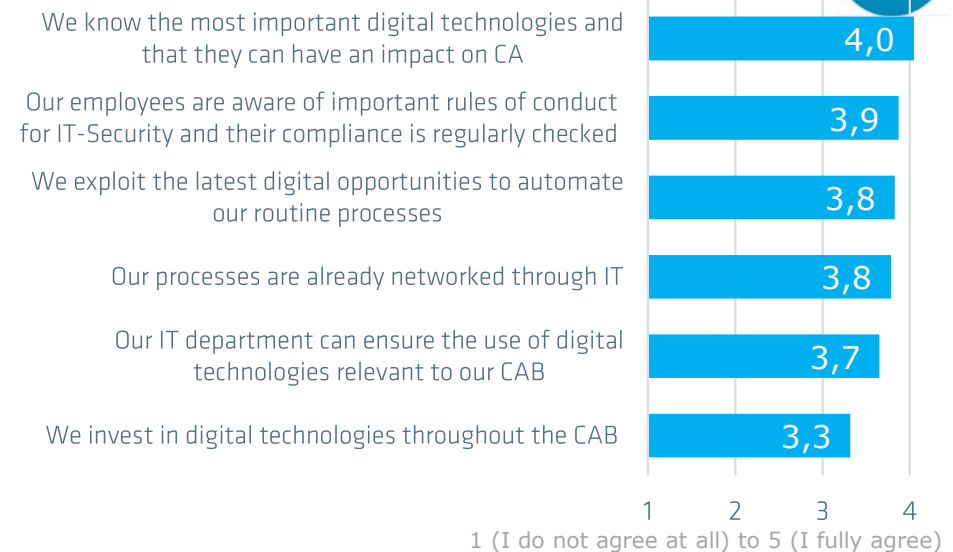
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Dimensions of digital maturity: Detailed overview

Strategy (n=23)



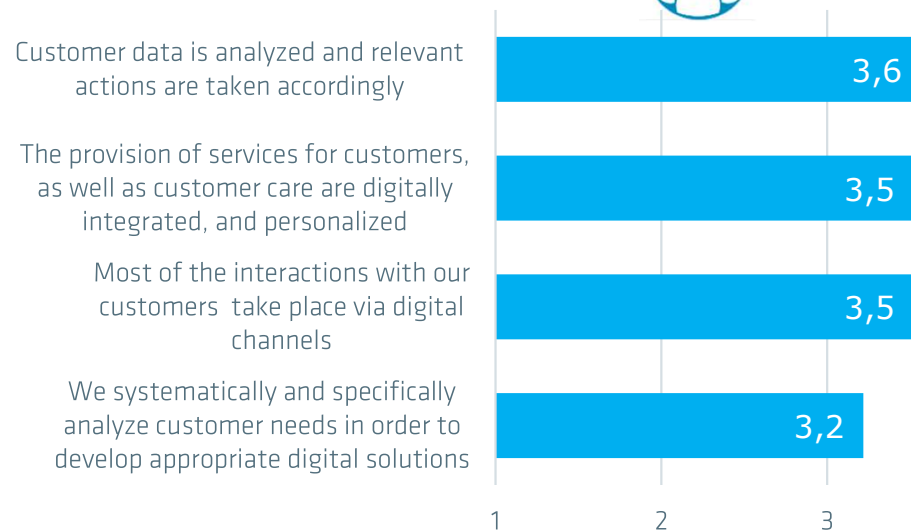
Information Technology & Process Digitalization (n=23)



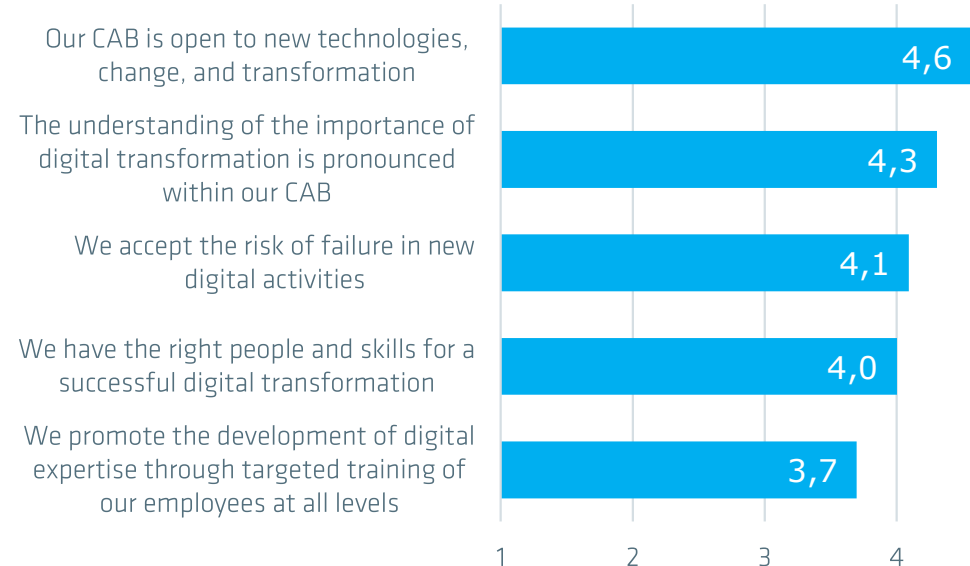
- In most CABs (80%), digitalization plays a central role in their overall strategy, with 76% having a well documented digital strategy.
- 64% have set up a Digital Roadmap and 60% use key metrics to measure the implementation status of their digitalization strategy.
- At least 66% of CABs are aware of, invest in and are able to use digital technologies properly while complying with IT security regulations. 76% of CABs have networked their processes and automated routine procedures.

Dimensions of digital maturity: Detailed overview

Customers (n=23)



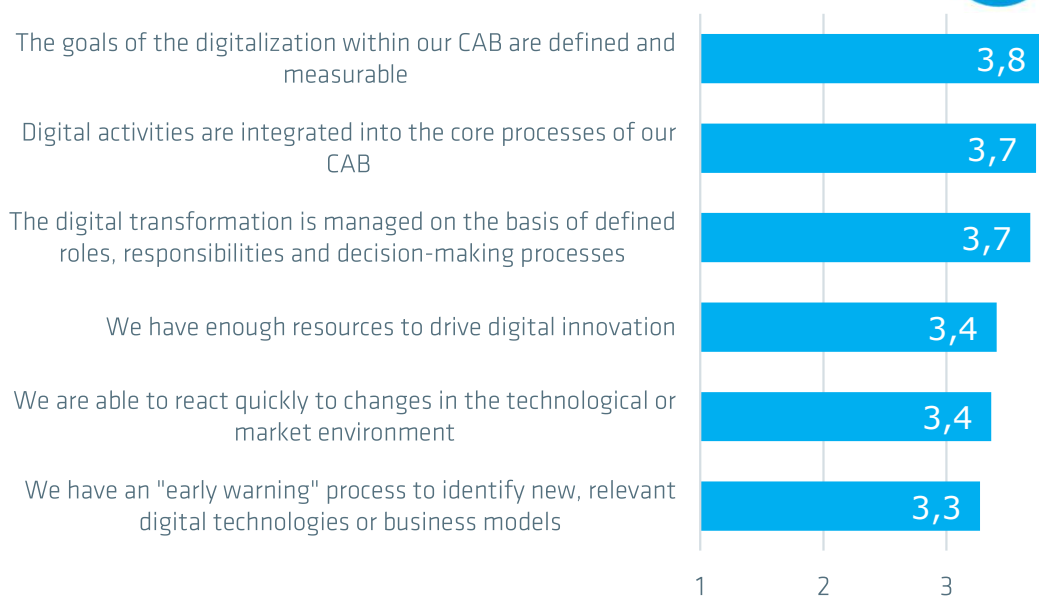
Culture & Expertise (n=23)



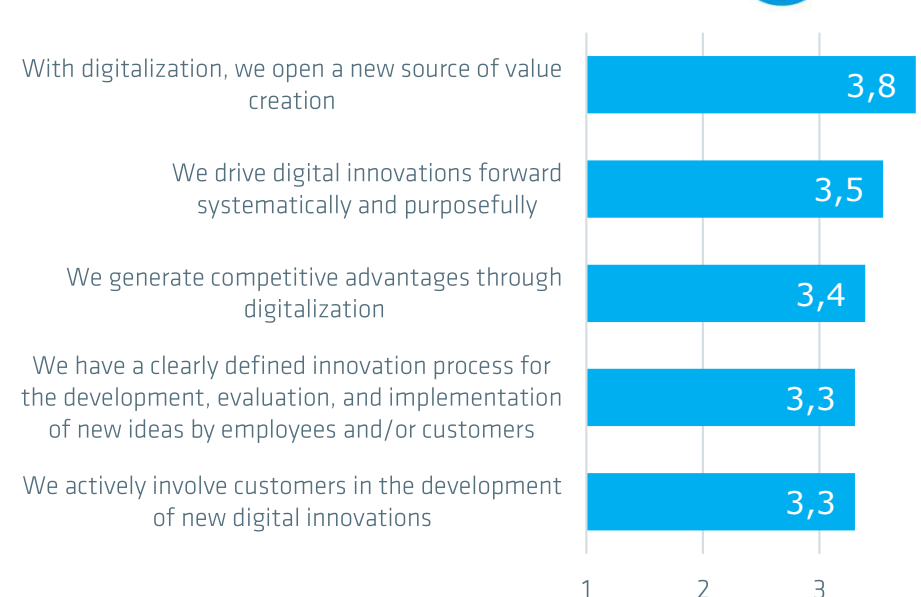
- 70% of CABs in North Macedonia interact with their customers via digital channels.
- 70% offer digitally integrated services to customers and 64% of them develop appropriate digital solutions based on customer needs.
- CABs in North Macedonia are definitely open to new technologies, changes and transformations (92%). At least 86% of them have a strong understanding of the importance of digital transformation and 80% have the right skills to successfully implement the change.

Dimensions of digital maturity: Detailed overview

Organization & Change Management (n=22)



Innovation (n=23)



- 74% of CABs have integrated digital activities into their core processes. The clear definition of responsibilities and strategic goals is key to the implementation of digital transformation.
- For the majority of participants (76%), digitalization represents a new source of value creation.
- However, customers are hardly involved in the innovation process.

Dimensions of digital maturity: Detailed overview

Cooperation (n=23)



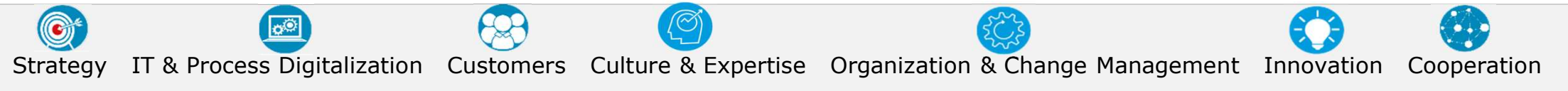
- In order to work on the topic of digitalization, 74% of CABs build additional knowledge through external expert consultations. They also collaborate effectively with stakeholders on various digital activities.
- 62% maintain a partner network with external service providers.

Digital Maturity Model

Level 1 (Beginner)



Description Level 1: Beginner	Dimensions						
The understanding of the importance of digital transformation is pronounced within our CAB							
Our CAB is open to new technologies, change and transformation							



Digital Maturity Model

Level 2



Description Level 2

Dimensions



Digitalization has a central role in our overall strategy	■						
Our digital strategy is well documented and communicated	■						
We exploit the latest digital opportunities to automate our routine processes		■					
Our processes are already networked through IT		■					
We know the most important digital technologies and that they can have an impact on CA		■					
Our IT department can ensure the use of digital technologies relevant to our CAB		■					
Our employees are aware of Important rules of conduct for IT-Security and their compliance is regularly checked (e.g., through audits)		■					
We have the right people and skills for a successful digital transformation				■			
We accept the risk of failure in new digital activities				■			
We promote the development of digital expertise through targeted training of our employees at all levels				■			
Digital activities are integrated into the core processes of our CAB					■		
With digitalization, we open a new source of value creation						■	
We work across departments and functions on the topic of digitalization							■
We use exchanges with external experts to build up additional knowledge in the area of digitalization							■

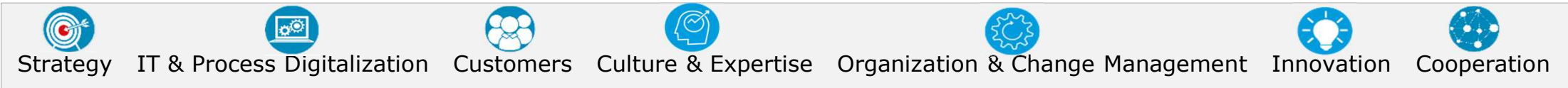
Strategy
 IT & Process Digitalization
 Customers
 Culture & Expertise
 Organization & Change Management
 Innovation
 Cooperation

Digital Maturity Model

Level 4

















Description Level 3	Dimensions						
We evaluate new technologies as well as changes in customer behavior to identify potential for digital innovation	■						
Most of the Interactions with our customers (e.g., advise, purchase conclusion and customer service) take place via digital channels			■				
The provision of services for customers, as well as customer care are digitally integrated, and personalized			■				
Customer data is analyzed, and relevant actions are taken accordingly			■				
The digital transformation is managed on the basis of defined roles, responsibilities and decision-making processes					■		










Digital Maturity Model


Level 4


Description Level 4	Dimensions						
							
We have clearly defined the responsibilities for implementing the goals derived from the strategic consideration on digitalization	■						
We invest in digital technologies throughout the CAB (e.g., for digital customer communication, process automation)		■					
The goals of the digitalization within our CAB are defined and measurable					■		
We drive digital innovations forward systematically and purposefully						■	
We actively involve customers in the development of new digital innovations						■	
We have a clearly defined innovation process for the development, evaluation, and implementation of new ideas by employees and/or customers						■	
We generate competitive advantages through digitalization						■	
We collaborate effectively with stakeholders (e.g., customers, suppliers, competitors, scientific institutions) on digital initiatives							■
We undertake actions (e.g. workplace concepts) that support employees in collaborating effectively							■
							
	Strategy	IT & Process Digitalization	Customers	Culture & Expertise	Organization & Change Management	Innovation	Cooperation


Digital Maturity Model


Level 5 (Experts)


Description Level 5: Expert	Dimensions						
							
We use key metrics to measure the implementation status of our digitalization strategy	■						
We have defined a step-by-step implementation plan (Digital Roadmap) for achieving the goals	■						
We systematically and specifically analyze customer needs in order to develop appropriate digital solutions			■				
We have an "early warning" process to identify new, relevant digital technologies or business models for us					■		
We are able to react quickly to changes in the technological or market environment					■		
We have enough resources in our day-to-day business to drive digital innovation					■		
In the field of digitalization, we maintain a partner network with external service providers, start-ups, or research institutions							■



Strategy



IT & Process Digitalization


Customers


Culture & Expertise


Organization & Change Management


Innovation


Cooperation