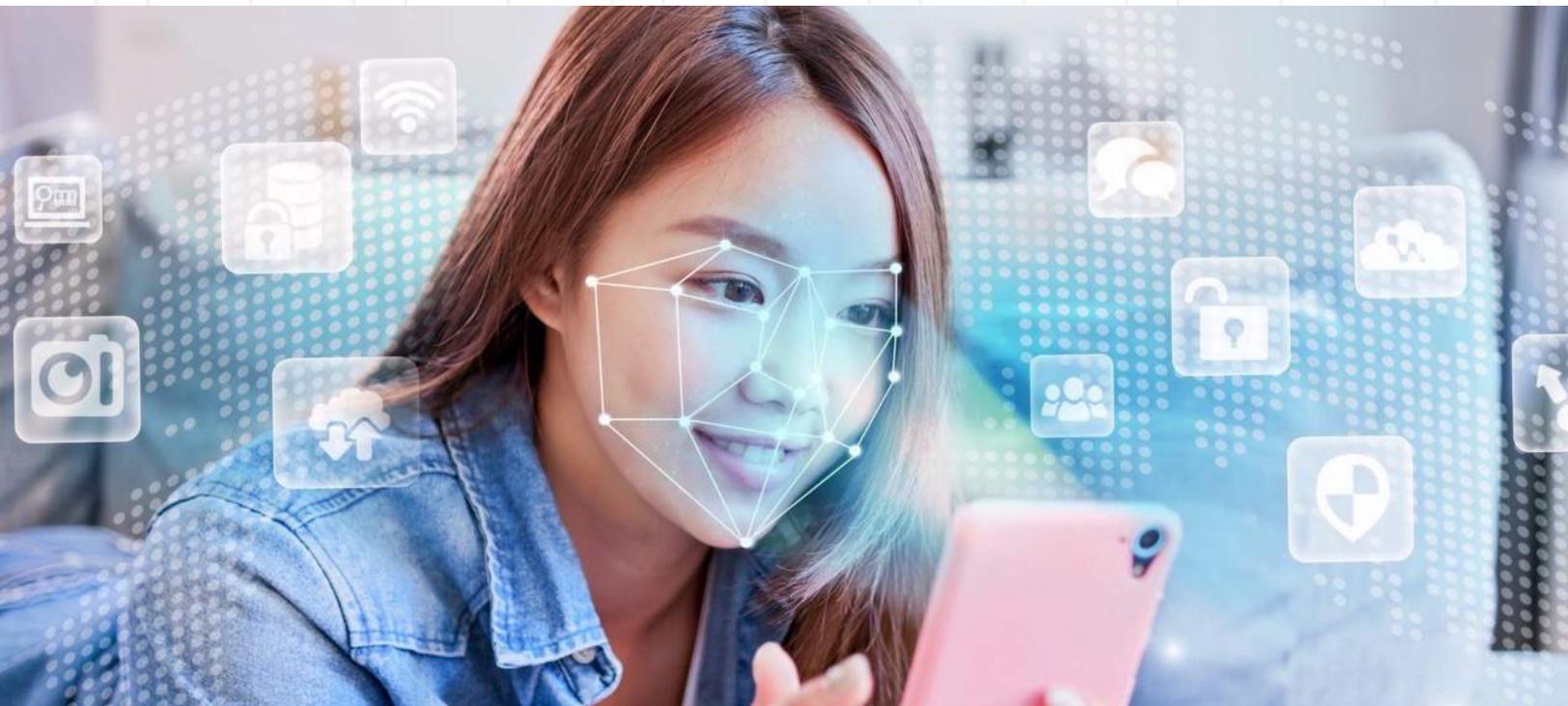




Mapping the Market Landscape for

FACE VERIFICATION & LIVENESS

for Remote Digital Onboarding



A woman with long brown hair is looking at a pink tablet. A white wireframe overlay is positioned over her face, representing face verification technology. The background is a blurred office setting with various icons like Wi-Fi, a house, a person, and a padlock overlaid on it.

Mapping the Market Landscape for
FACE VERIFICATION & LIVENESS
for Remote Digital Onboarding

January 2021

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INTRODUCTION TO THE REPORT

Face verification and liveness detection have changed the game for remote digital onboarding. The market landscape is being shaped by a range of innovators. From biometric face recognition and liveness detection technology providers, to targeted digital onboarding and identity verification platforms, to the biometric identity big three - IDEMIA, NEC, and Thales, everyone wants in. The market is heating up as the stakes couldn't be higher.

This report provides unique insight into the marketplace leveraging Acuity's proprietary Constellation model to analyze the relative position of 24 vendors that either:

1. Offer core biometric face verification and/or liveness detection software that is integrated into third party digital onboarding solutions, or
2. Develop proprietary face verification and/or liveness detection software as part of their own digital onboarding solutions or component offerings.

FACE VERIFICATION & LIVENESS for Remote Digital Onboarding

In the age of COVID *Remote Digital Onboarding* near instantaneously transformed from a future strategic scenario to an urgent, critical-path business priority.

Market leading remote digital onboarding solutions rely on biometrics and liveness detection to provide secure, reliable, and trusted identity verification.

- ✓ Biometric *Face Verification* is a critical component of remote digital onboarding solutions. It includes a one-to-one (1:1) match of a face image captured at the time of onboarding with an image captured from a trusted credential such as a National ID card, a driver's license, or a passport.

- ✓ **Liveness detection** is also critical for secure and reliable remote digital onboarding. Liveness detection ensures that there is a live human being present at the time of onboarding that is not attempting to conceal their true identity.

Solutions for remote Digital Onboarding vary by vendor and use case but generally include the following steps where the order of operations may vary:

- Capture one or more images of a trusted credential.
- Extract data from credential and confirm validity.
- Capture one or more photo or video images of the user.
- Perform one or more liveness checks.
- Verify the live image against the image in the credential or in a linked identity database.

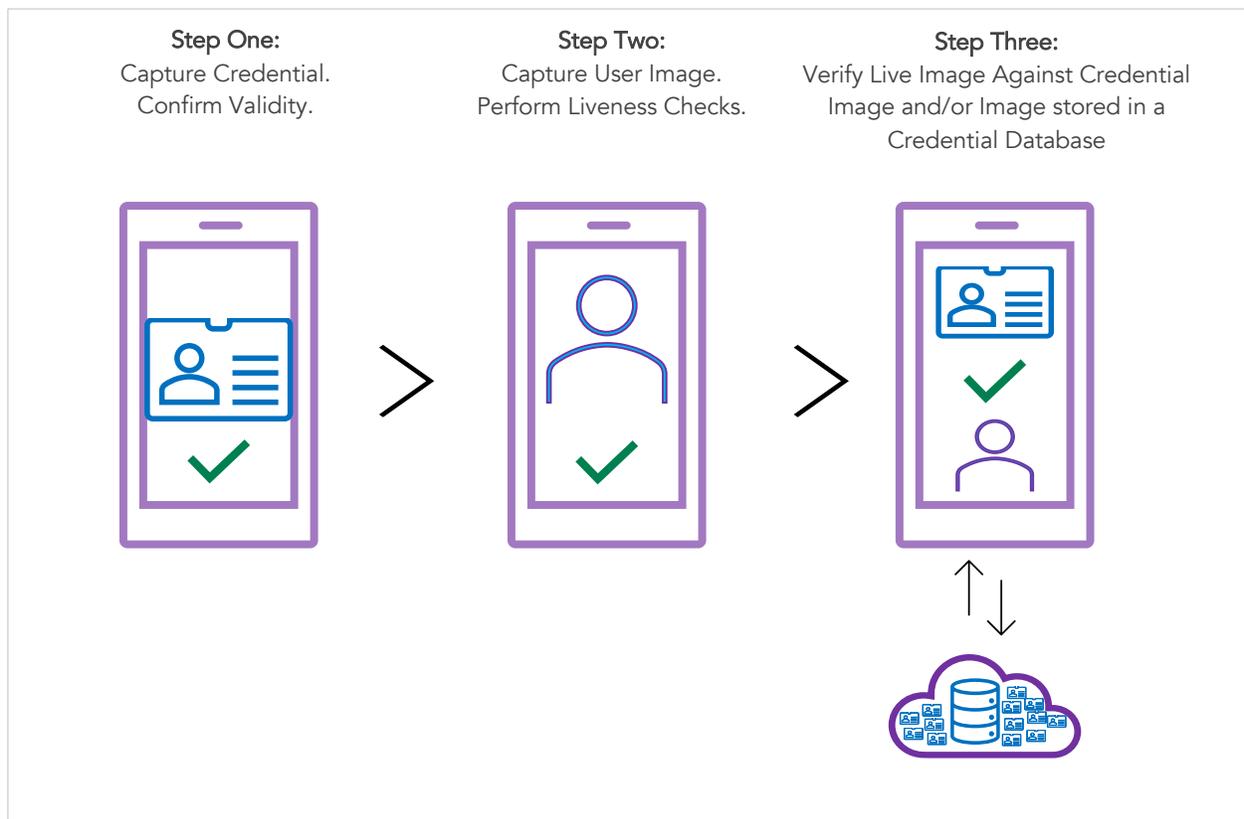


Figure 1: Remote Digital Onboarding Process

Understanding Face Recognition

Biometric face recognition underlies a range of face-based identification and authentication applications and use cases. Defining and applying terminology appropriately is critical to understanding how this technology works within the context of digital onboarding.

Face Verification

For the purpose of this analysis, face recognition is designed to capture and compare facial images with the intent of validating a claimed or asserted identity against an established identity. This is inherently a one-to-one (1:1) matching process that is used to *authenticate* or *validate* an existing identity.

Face Identification

In this application of face recognition, a facial image is captured and compared to a large group of images to uniquely identify an individual. This is inherently a one-to-many (1:N) matching process that is often associated with law enforcement and commercial surveillance. Recently, privacy advocates have pushed back against face recognition used for identification applications. Particularly in regard to privacy rights in public spaces where individuals are not aware their facial images are being captured. ***Remote digital onboarding use cases inherently require active user consent.***

Face Liveness Detection

Liveness detection is the means to determine whether the face image being captured is from a live, present, human. Liveness detection capabilities are also designed to thwart a range of Presentation Attacks that may include disguises, 2D or 3D masks, digital images, and other digital interventions including deepfakes¹ intended to conceal the true identity of the user as a means to engage in fraud, theft, or other nefarious or criminal activity.

Figure 2: Face Recognition Definitions

¹ The term *deepfake* is typically used to refer to a video that has been edited using an algorithm to replace the person in the original video with someone else (especially a public figure) in a way that makes the video look authentic. Merriam-Webster Dictionary <https://www.merriam-webster.com/words-at-play/deepfake-slang-definition-examples>

Vendor Categories

The Vendors in this analysis fall into one of five categories that defines their primary business: *Digital Onboarding Solution, Identity Verification Platform, Biometric Core Technology, Biometric Identity Platform, and Big Three Biometric Identity*. With the exception of Biometric Core Technology providers that offer face verification and/or facial liveness only, each offers digital onboarding as a standalone product, as part of a suite of products, or as a series of capabilities built from a modular set of components.

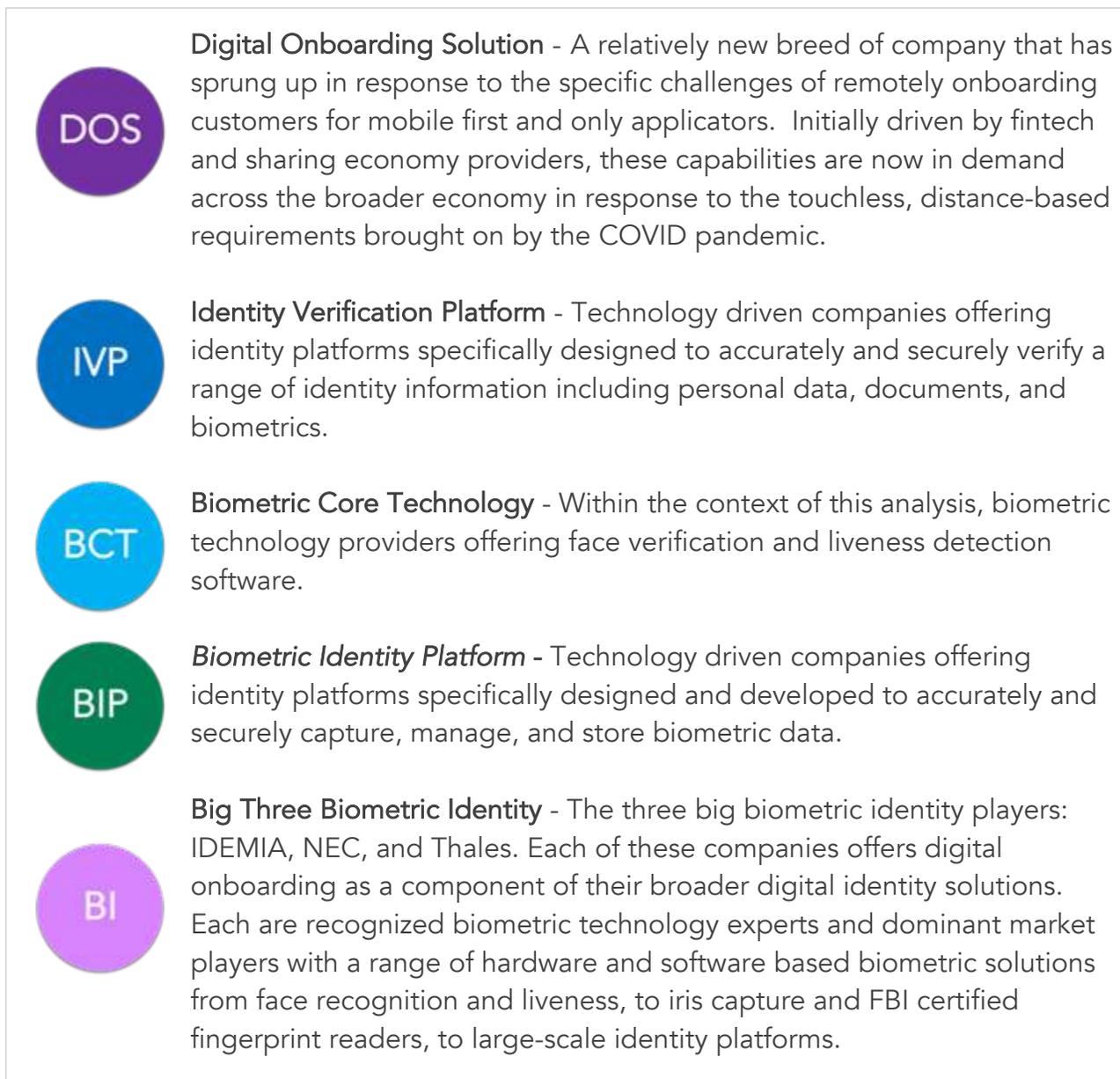


Figure 3: Vendor Categories Defined

Vendors Included in this Report

This report is focused exclusively on digital onboarding solutions that rely on face verification and liveness detection.

Vendors included in this report develop their own face verification and/or liveness detection software falling into one of two broad categories:

- 1) Integrates into proprietary remote digital on-boarding solutions and/or component offerings, or
- 2) Is offered to customers and/or partners to integrate into their remote digital on-boarding offerings.

There are some cases where vendors offer their own face verification software but rely on third party liveness detection. This will be noted.

Vendors that offer remote digital onboarding solutions that rely purely on third-party face verification and liveness detection solutions such as JUMIO, Trulioo, and Acuant are not included.

This report provides a snapshot of this rapidly evolving market landscape. The list of vendors included in this report may not be comprehensive. Vendors may not appear for various reasons including:

- Limited visibility: Vendors and products were not easily discovered during market research.
- Lack of information: Some vendors chose not to respond to outreach and there was insufficient market data and information publicly available to provide an assessment.

Vendor List

The following vendors are included in this analysis:



Figure 4: Vendor Logos

INTRODUCTION TO THE CONSTELLATION

The Constellation

The Acuity Constellation defines the market landscape and positions vendors in one of four categories based on Acuity's proprietary CTPM quadrant-based, visual modeling tool. The CTPM model is based on two multi-faceted indices that evaluate Performance along the X-axis and Market Position along the Y-axis.

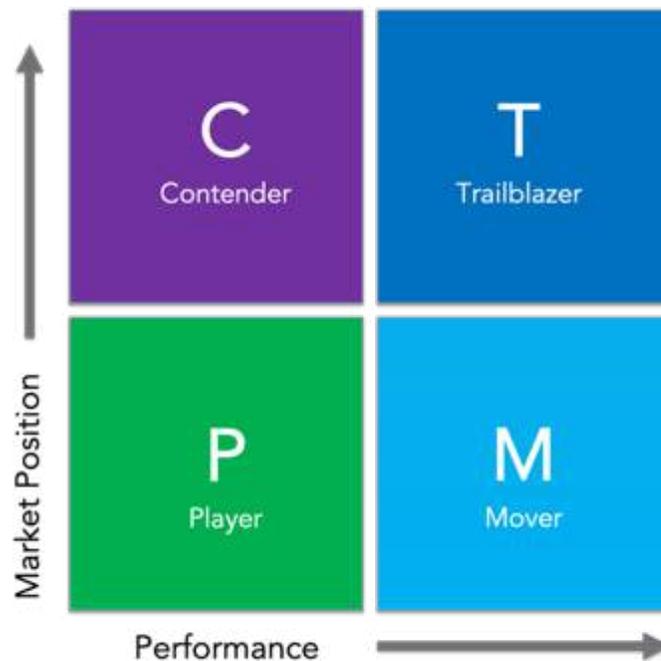


Figure 5: CTPM Landscape

- ✓ The CTPM Performance index© is a quantitative assessment based on Key Performance Metrics (KPMs) that indicates the level of overall performance successes such as revenue and verification volume and growth rates, certifications, and market footprint.
- ✓ The CTPM Market Position Index© is a qualitative assessment based on Key Market Position Metrics (KMPMs) that indicate the effectiveness of carving out, communicating, and differentiating a defensible market position.

CTPM Key Performance Index Metrics (X-axis)

The following twelve metrics comprise the Constellation CTPM KPMs:

- | | |
|----------------------------------|---------------------------------|
| ✓ Number Of Customers | ✓ Geographic Footprint |
| ✓ Company Size | ✓ Third Party Testing |
| ✓ Total Revenue | ✓ Market Sector |
| ✓ Revenue Growth Rate | ✓ High-Profile Customers |
| ✓ Transaction Volume | ✓ Financial Stability/Resources |
| ✓ Transaction Volume Growth Rate | ✓ Speed Of Implementation |

Figure 6: CTPM Performance Index Metrics

CTPM Market Position Index Metrics (Y-axis)

The following nine metrics comprise the Constellation CTPM KMPMs:

- | | |
|---|---------------------------|
| ✓ UVP (Unique Value Proposition) | ✓ Social Media Presence |
| ✓ Technology Innovation and
Differentiation | ✓ Customer Brand Identity |
| ✓ Delivery Model – SaaS, On Prem, On
Device | ✓ Thought Leadership |
| ✓ Marketing Strategy, Position, and
Programs | ✓ Sales Strategy |
| | ✓ Market Sector Dominance |

Figure 7: CTPM Market Position Index Metrics

Each vendor is evaluated against each of the KPMs and KMPMs and is assigned a value between zero to six for each metric. These values are averaged within each index to arrive at a final value for Performance and Market Position indices for each vendor.

Using these final index values, the CTPM quadrant-based, visual tool locates a vendor's competitive position within one of the following four categories: Contenders, Trailblazers, Players, Movers.

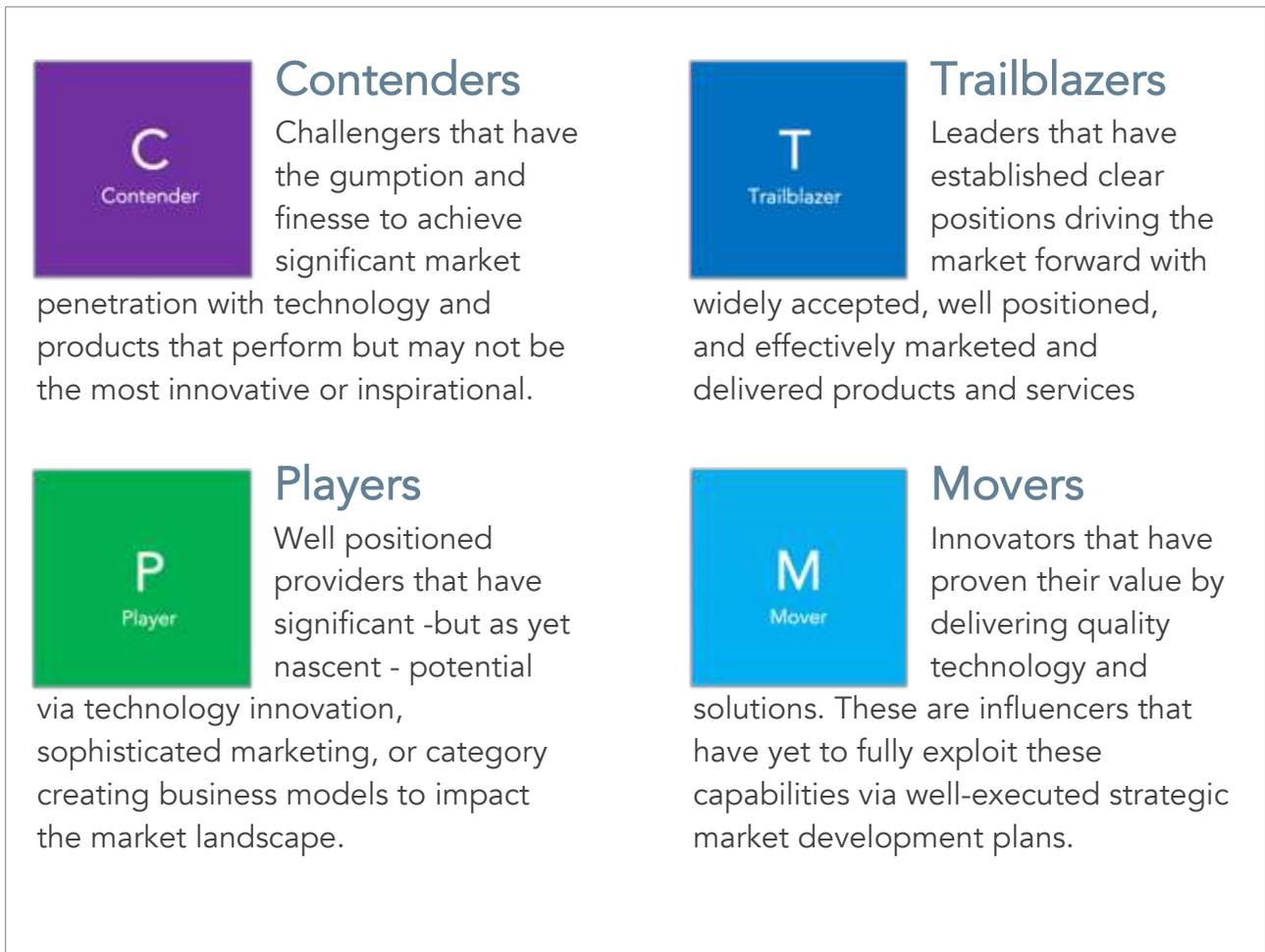


Figure 8: CTPM Quadrants Defined

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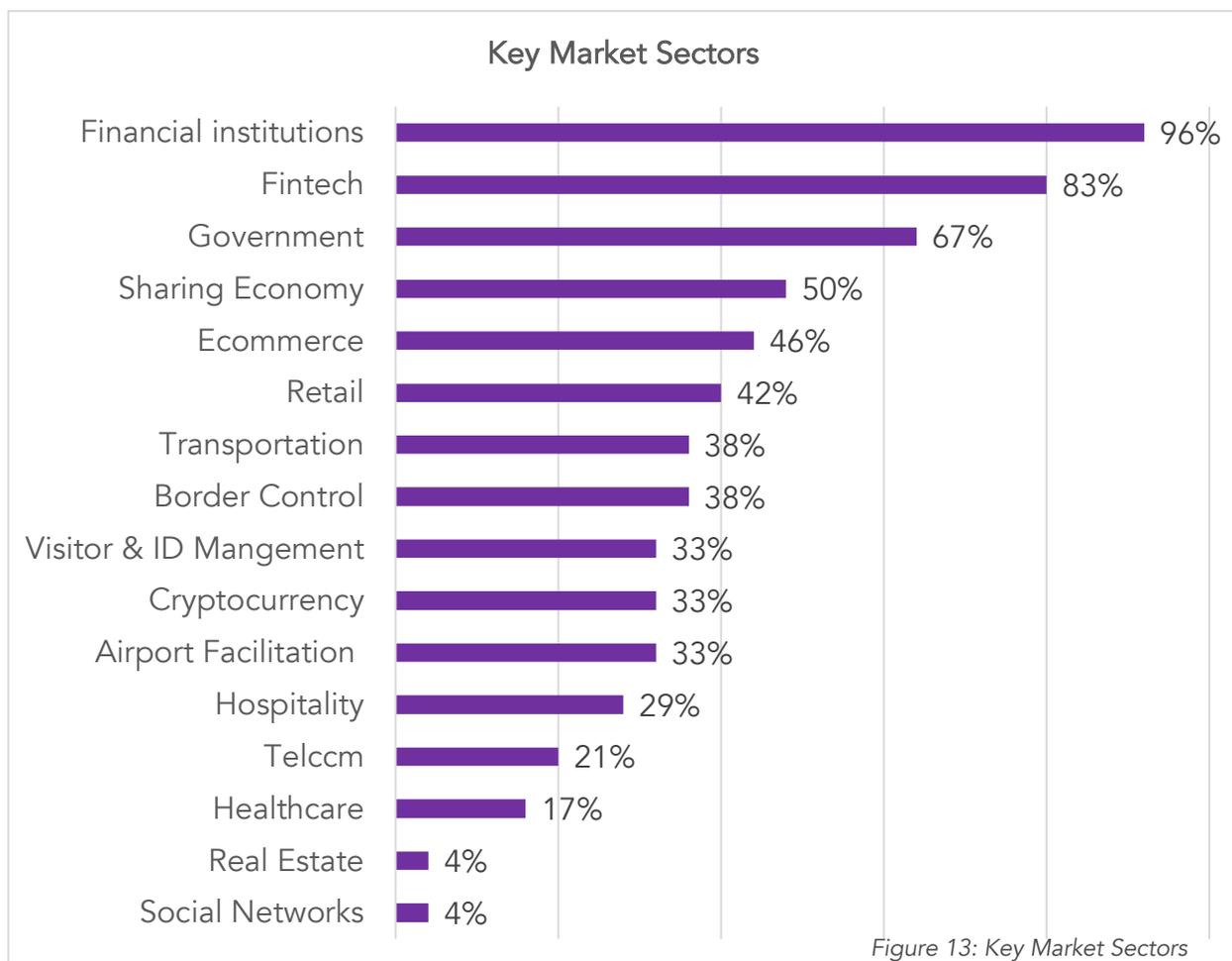
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MARKET ANALYSIS

KEY MARKET SECTORS

The chart below shows the market sector focus of the vendors included in this analysis. A full 96% of vendors consider financial institutions a key sector followed closely by fintech. Government, the sharing economy, ecommerce and retail round out the most dominant sectors. While COVID has accelerated digital transformation in a number of market sectors including airport facilitation, hospitality, retail etc., face-based remote digital onboarding players are firmly focused on transaction-based opportunities.



As the world moves into the next phase of the COVID19 pandemic, proving health status – vaccination and/or testing – will drive massive reliance on mobile solutions for access to travel, hospitality, business events, entertainment, etc. Within a year, the Key Market Sectors chart will reflect this shift with expanded presence in sectors that rely on remote onboarding combined with health status for in person experiences.

THE CONSTELLATION

CONSTELLATION EXPLAINED

The CTPM Model

The Acuity Constellation defines the market landscape and positions vendors in one of four categories based on Acuity’s proprietary CTPM quadrant-based, visual modeling tool. The CTPM model is based on two multi-faceted indices that evaluate Performance along the X-axis and Market Position along the Y-axis.

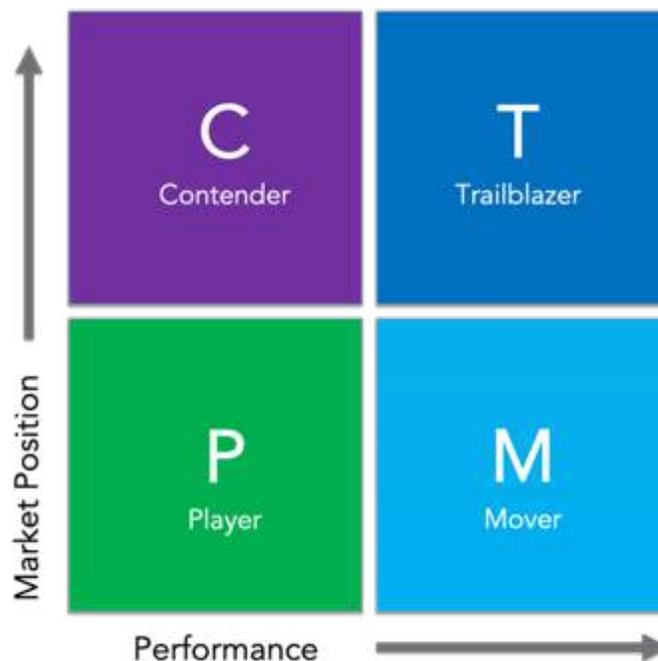


Figure 14: CTPM Landscape

- ✓ The CTPM Performance index© is a quantitative assessment based on Key Performance Metrics (KPMs) that indicate the level of overall performance success such as revenue and verification volume and growth rates, certifications, and market footprint.
- ✓ The CTPM Market Position Index© is a qualitative assessment based on Key Market Position Metrics (KMPMs) that indicate the effectiveness of carving out, communicating, and differentiating a defensible market position.

CTPM Quadrant Definitions

Using the final Performance Index and Market Position Index values, the CTPM quadrant-based, visual tool locates a vendor’s competitive position within one of the following four categories: Contenders, Trailblazers, Players, Movers.



Contenders

Challengers that have the gumption and finesse to achieve significant

market penetration with technology and products that perform but may not be the most innovative or inspirational.



Trailblazers

Leaders that have established clear positions driving the market

forward with widely accepted, well positioned, and effectively marketed and delivered products and services.



Players

Well Positioned providers that have significant - but as yet nascent -

potential via technology innovation, sophisticated marketing, or category creating business models to impact the market landscape.



Movers

Innovators that have proven their value by delivering quality technology and

solutions. These are influencers that have yet to fully exploit these capabilities via well-executed strategic market development plans.

Figure 17: CTPM Quadrants Defined

Constellation Assessment Process

The Constellation analysis is completed in five steps:



➔ Key Metric Analysis

Define key metrics for the Performance and Market Position indices used to evaluate vendors within the market landscape.

➔ Identification and Outreach

Identify and qualify vendors that fit report criteria. Outreach to request participation via completion of a questionnaire and follow up executive interview.

➔ Profiling and Categorization

Research to complete vendor profiles. Group vendors according to the following categories that emerged during profiling research:

- ✓ Digital Onboarding Solutions
- ✓ Identity Verification Platform
- ✓ Biometric Core Technology
- ✓ Biometric Identity Platform
- ✓ Big Three Biometric Identity

➔ Constellation Index Scoring

Assign values to each vendor for each key metric in the Performance and Market Position indices based on data gathered from questionnaires, interviews, and research.

➔ Targeted Composite Analysis

Create composite analysis metrics to enable comparative evaluation of individual vendors.

Figure 18: Constellation Assessment Process

Vendor Categories

The Vendors in this analysis fall into one of five categories that defines their primary business. *Digital Onboarding Solution, Identity Verification Platform, Biometric Core Technology, Biometric Identity Platform, and Big Identity.* With the exception of Biometric Core Technology providers that offer face verification and/or facial liveness only, each offers digital onboarding as a standalone product, as part of a suite of products, or as a series of capabilities built from a modular set of identity functions.



Digital Onboarding Solution - A relatively new breed of companies that have sprung up in response to the specific challenges of remotely onboarding customers by mobile first and only applicators. Initially driven by fintech and sharing economy providers, these capabilities are now in demand across the broader economy in response to the touchless, distance-based requirements brought on by the COVID pandemic.



Identity Verification Platform - Technology driven companies offering identity platforms specifically designed to accurately and securely verify a range of identity information including personal data, documents, and biometrics.



Biometric Core Technology - Within the context of this analysis, biometric technology providers offering face verification and liveness detection solutions.



Biometric Identity Platform - Technology driven companies offering identity platforms specifically designed and developed to accurately and securely capture, manage, and store biometric data.



Big Three Biometric Identity - The three big biometric identity players: IDEMIA, NEC, and Thales. Each of these companies offers digital onboarding as a component of their broader digital identity solutions. Each are recognized biometric technology experts and dominant market players with a range of hardware and software based biometric solutions from face recognition and liveness, to iris capture and FBI certified fingerprint readers.

Figure 19: Vendor Categories Defined

COMPOSITE INDEX EVALUATION

Composite Indices

The following six composite indices provide comparative evaluation metrics for vendors in the remote digital onboarding marketplace.

- ✓ **Growth and Resources** – Current revenue and transaction volume and year-on-year growth as well as financial resources available to sustain and support ongoing growth. The overall size of the company as well of the proportionate size of the remote digital onboarding business relative to the overall business is factored in.
- ✓ **Market Presence** – Evaluates the relative profile of the customer base and key customers, the overall geographic footprint and market sectors, as well as specific geographic regions and markets where a level of dominance has been achieved.
- ✓ **Proof Points** – Combines 3rd party testing results and certifications with speed of Implementation.
- ✓ **Unique Positioning** – Considers the vendors Unique Value Proposition (UVP) along with differentiable technology innovation.
- ✓ **Business Model** – Assesses the solution delivery model – SaaS, On Premise, On Device – and the overall sales strategy including channel scope and quality and range of partnerships.
- ✓ **Strategic Marketing** – Captures the overall marketing strategy and position including messaging, brand, channels, thought leadership, use of digital, social media presence and engagement.

Composite Index Ranking

Vendor are scored from zero (lowest) to six (highest) against Composite Indices. Values are represented by the following icons:



Figure 33: Composite Index Icons

PLAYER PROFILES

KEY INSIGHTS

STRATEGIC ANALYSIS

Seizing this opportunity requires a highly strategic approach. This includes:

- **CRAFTING** a clear and compelling alternative narrative to device-based, convenience driven, digital onboarding for financial services.
- **DEFINING** a clear and highly leveragable strategic plan that provides a roadmap for market disruption.
- **BUILDING** relationships, forming partnerships, and establishing credibility among critical influencers.



APPENDIX

ACRONYMS

AI	Artificial Intelligence
AML	Anti Money Laundering
API	Application Programming Interface
FRVT	Facial Recognition Vendor Testing
KYC	Know Your Customer
ML	Machine Learning
NIST	National Institute of Standards and Technology
NLP	Neuro-linguistic Programming
PAD	Presentation Attack Detection
SDK	Software Development Kit
UVP	Unique Value Proposition

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Strategic innovator, market visionary, and forecasting guru, Maxine Most brings decades of practical expertise in the unpredictable and volatile world of emerging technology to the rapidly evolving biometrics and digital identity marketplace.

With a stellar reputation for accurately anticipating market twists, turns, and trend, Maxine offers deep, knowledge-based market intelligence, crafts innovative and disruptive strategies, and creates digital and traditional marketing experiences that delight customers, capturing their attention and imagination.

Maxine founded Acuity Market Intelligence to help technology innovators thrive with bold, reliable Intelligence, Strategy and Marketing services. And, with a proven record of providing reliable, actionable biometric and related digital identity market insight, Acuity is known as the Definitive Source for Biometrics Market Intelligence.

Maxine is the author of numerous biometric research reports including "The Airport Automated Biometric Facilitation Report: From Curb to Gate", "The Global Biometrics and Mobility Report: The Convergence of Commerce and Privacy", "The Global Automated Border Control Industry Report: Airport eGates & Kiosks", "The Global National eID Industry Report", "The Global ePassport and eVisa Industry Report", and "The Future of Biometrics", as well as a contributor to several books including "Digital Identity Management" edited by digital identity thought leader David G. Birch.

Maxine regularly offers insight and analysis in on and off-line publications, is quoted often in industry, business, and consumer press, and presents regularly at industry events on the evolution and development of biometrics and digital identity markets. She is a graduate of the University of California, San Diego with a multi-disciplinary degree in Mathematics and Computer Science with minors in Visual Arts and Economics.

OUTMANEUVER THE COMPETITION

Acuity specializes in market-breaking, category-creating business models and strategic marketing plans that are as innovative and unique as our clients' technology and solutions.

- ✓ We help clients acquire the market intelligence they need to understand how to position themselves for the most lucrative market opportunities,
- ✓ We create comprehensive strategic marketing plans that provide perspective on how to approach the market, as well as drilling down to the granular details of tactical implementation.
- ✓ We incorporate client vision and values into business models, methods, and strategic and tactical plans that we execute flawlessly..

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Acuity is uniquely qualified to work with biometric-based digital identity providers.

- ✓ We are "The Definitive Source for Biometrics Market Intelligence" with a proven record of accurately anticipating biometric and digital identity market trends.
- ✓ Big name firms rely on Acuity expertise – directly or through OTS and custom research – when providing services to their own biometrics



Mapping the Competitive Market Landscape for **FACE VERIFICATION & LIVENESS** for Remote Digital Onboarding

JANUARY 2021

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