Advances in Biometrics and Mobility

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Provides Telecommunications and IT Solutions

- Around **110,000** employees worldwide
- About **USD 26.5 billion** net sales*
- **303** consolidated subsidiaries
- Headquarters: **Tokyo, Japan**
- **120 years** of brand success
- **World's Top 100** Most Innovative** Organizations
- **Fortune Global 500** company

*Data as of March 31, 2019
** World's Top 100 Most Innovative Organizations for 2015 (Reuters)

History of Biometrics

“Bio”(Life) “metrics” (to Measure)

- First used hundreds of years ago in business transactions
- First systematic capture of hand images for recognition in 1858
- Anthropometries, using detailed body measurements introduced in 1870, later found to be fallible and the systems collapsed
- First fingerprint classification system using 10 fingerprints developed in 1892
- Push for first automated systems in 1969, United States mandated National Institute for Standards & Technology to analyse potential of automating identification techniques
- Automated systems accuracy and applicability grew together with technological advancements
- Today single systems capable of uniquely identifying persons across billions of sets of multi biometrics at high speeds

Progress of Biometric Identification Systems – becoming mainstream

Initial Biometric Systems

- Initial Biometric systems focused only on fingerprint identification mostly in the Law Enforcement field
- Soon became apparent that parallel applications existed in the Civil Services and ultimately the Private Sector
- Ultimately fingerprint biometric identification systems became deployed in both Law Enforcement and Civil arenas
- As deployment and Research & Development progressed abilities to identify on different biometrics became more mainstream
- Abilities soon existed to verify and identify persons using not only fingerprints but also facial images, iris, retina, voice, DNA and other less known modes
- These abilities however existed in silos or on different subsystems

Capabilities in terms of accuracy and speed of processing on algorithms from different vendors on these disparate biometric systems soon became apparent and problematic to prove
US Government mandated NIST as a result of the PATRIOT Act

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

"As a result of the PATRIOT Act, Congress has tasked NIST with a statutory mandate to develop and certify a highly accurate technology standard that shall include biometric identifiers."

https://www.nist.gov/itl/iad/image-group

Progress of Biometric Identification Systems – accepting the technology

NIST Testing

The US Government had many large scale biometric systems – with no independent efficacy tests on the technology

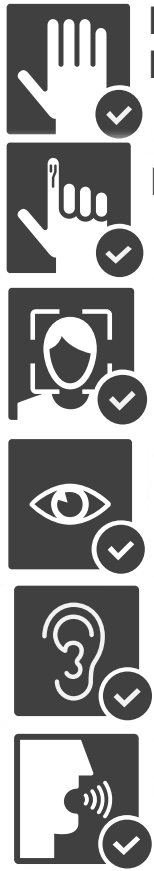
- In light of its mandate, NIST commenced with a multitude of tests
- Commencing with fingerprint identification – as new biometric identification techniques became more mainstream new tests for these were included
- Tests are always independent and the results made publically available
- All large scale customers now use the NIST testing results as a benchmark for adjudicating potential vendors
- Standardisation of many components making up biometric systems are arranged by NIST

All mainstream biometric technology vendors algorithms are tested in the relevant NIST tests

AFIS becoming ABIS

Moving to Automated Biometric Identification Systems

- A few major factors initiated a move from single biometric identification systems to multi-biometric identification systems
  - Increased requirements for large scale biometric systems – more systems deployed
  - Improvement in hardware and database processing abilities – faster and more powerful systems
  - Increased deployment and experience from the user and vendor side together with increased ability to manage such large systems – higher levels of experience in deployment and support
  - Increased number of automated biometric identification systems – vast numbers deployed across the world
  - Drive for higher accuracy – fusion of biometrics in search and results
  - Ability of algorithms for different biometrics to accurately and quickly identify – improvement across the different modalities
  - NIST through its independent testing able to ratify the technologies – technologies becoming more widely accepted



Accuracy and Biometric Modality Adoption

Through mainstream adoption systems became larger, more complex & advanced

- While the use of AFIS systems and associated services became entrenched, the technology in terms of accuracy and processing speeds advanced. General IT technology advancements facilitated further advancement

"Between 2014 and 2018, facial recognition software got 20 times better" - NIST

- New use cases drove further entrenchment in every day life which in turn led to the progression of algorithmic advancement across a multitude of biometric modalities
- Soon vendors brought disparate modality processing into single systems leading to a move from AFIS to ABIS or MBIS
- Drive for higher accuracy has brought about the use of fused technologies using multi biometrics
- Processing multiple modalities within a single system brought fusion technologies to the fore the results leading to unsurpassed Biometric accuracy

Large scale adoption necessitated an evolvement towards mobility and portability

Biometrics & Mobility

Challenges with Portability and Connectivity

- Traditional largescale registration projects were hamstrung:
  - Connectivity across Africa has for the most part been limited
  - Large, heavy and often impractical Biometric take-on devices subject to failure often placed high risk and burden on process owners
  - Complex offline registration solutions often required

Challenges caused many countries execution of large ID projects to fail or acclaim only partial success

More than a Billion people in Africa remain mostly invisible, with no formal ID registration

Elections, Social Services, Financial Inclusivity and the like struggle to be delivered

Mobility Advances

Many Advances in Mobility since Increase in Popularity of Mobile Devices

- Mainstream Mobile device manufacturers devices have advanced significantly
- Connectivity across Africa has grown significantly

Strongest worldwide internet growth was reported in Africa, where the percentage of people using the Internet increased from just 2.1% in 2005 to 24.4% in 2018.

- Biometric Take-on manufacturers have taken advantage of the advances in the Mobile Phone arena (smarter devices and larger networks)
- New Snap-on devices for Mobile Phones and turn-key mobile biometric capturing devices have become common place
- Offline registration solutions are no longer complex
- Large scale registration exercises now possible using mobile devices
- Standardisation using Service Orientated Architectures (SOA) has been widely adopted
- Inter-connectivity using variety of mobile biometric capturing devices simplified and common place

Results of Advances in Both Biometrics & Mobility

The Perfect Storm has Arrived for the ID Inclusivity in Africa – Technologies are intersecting with the growing need

- An urgent need exists to document citizens across Africa
- Competition has driven down costs for National ID related technologies and Services
- Biometric Vendors are more and more able to deliver services in a Public Private Partnership model
- Revenue generation from the National ID Biometric systems is more viable
- Likewise competition has drastically increased efficacy of Biometric solutions within the National ID landscape
- Mainstream adoption of Biometrics have created inward bound streams for biometric data collection. These allow for collection touchpoints from Government to Citizen, ensuring data collection and relevance across time.
- Connectivity across Africa has grown significantly
- Biometric collection devices have become cheap, mobile and more accessible

Biometrics and Mobility are inextricably linked within the Africa context

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We collaborate closely with partners and customers around the world, orchestrating each project to ensure all its parts are fine-tuned to local needs.

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