



Biometrics – a security enabler

- LSEC, 1 december 2011
- Ronald Huijgens



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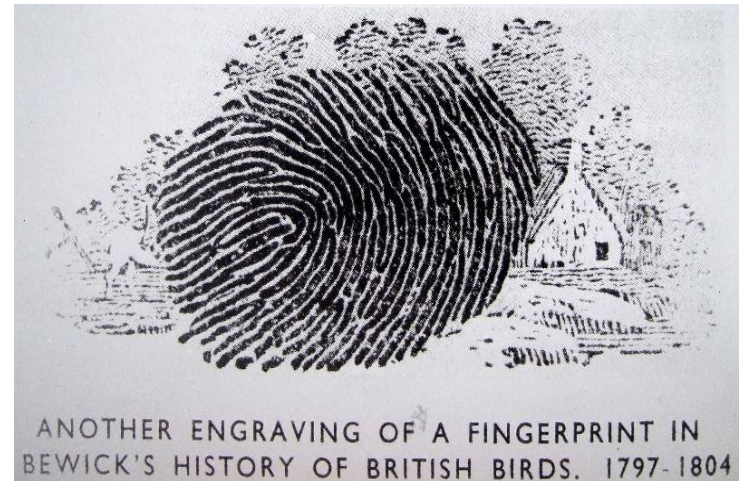
Introduction

- Ronald Huijgens
- Joined Unisys in 2005
- Since 2009 member of board of directors of NBF
- Specialisation biometrics since 2000



A bit of history

- The concept of biometrics is not new:
 - Biblical references: Job 37-7
 - 12th Century China/India
 - 1684 - Dr Nehemiah Grew
 - 1685 – Govard Bidloo
 - 1687 - Marcello Malpighi
 - 1818 - Thomas Bewick
 - 1823 - Czech physiologist Jan Purkenji
 - 1850/1900 - Dr Juan Vucetich, William Herschel,
– Dr Henry Faulds, Sir Francis Galton & Sir Edward Henry



Modern history of biometrics

- 1858 – First systematic capture of hand images
- 1896 – Henry develops a classification system
- 1901 – Fingerprints adopted by New Scotland Yard
- 1936 – Concept of iris recognition proposed
- 1960's – the first leaps forward into automated face recognition, fingerprint recognition
- 1969 – FBI pushes fingerprint matching
- 1975 – Research in sensors and minutiae extraction starts (FBI funded)
- 1980's – new products and technology appear face, fingerprint, speech, hand, iris

More recent history

- 1980's – Interface standards published
- 1993 – Face Recognition Technology (FERET) established
- 1994 – First iris algorithm patented (Daugman)
- 2000 – FRVT competition started, vascular pattern recognition described
- 2004 – EU adopts e-passports with face and fingerprint
- 2005 – VIS call for tender
- 2005 – Iris on the Move announced
- 2007 – First application of Biometric Encryption

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What is 'biometrics'



What is Biometrics?

Wikipedia:

“**Biometrics** (ancient Greek: *bios* = "life", *metron* = "measure") is the study of automated methods for uniquely recognizing humans based upon one or more intrinsic physical or behavioral traits.”

Another definition:

“Measurable physiological or behavioral characteristics that are used for the automated recognition of an individual”

Qualities of biometric features:

- Can not be forgotten
- Can not be lost
- Difficult to copy

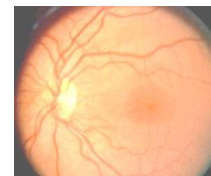
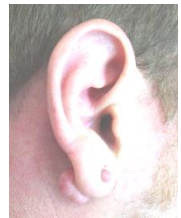
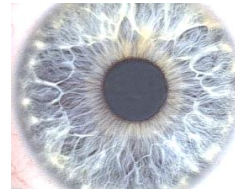
Types of biometric features

- Physiological
 - Describes **what** the biometric feature of the individual is (form, color, scent, texture,...)
 - Physical features that remain the same over time
 - May deteriorate over time (wear, age, ...)
- Behavioral
 - Describes **how** the individual behaves typically (gait, typing dynamics, writing, ...)
 - Dynamic (behavioral) features evolve over time (adaptation, natural development, changing health)
- Stability
 - Both physiological and behavioral can be stable or unstable!

Physiological Biometrics /1

- Physiological Biometrics:

- Fingerprint
- Hand geometry
- Face geometry
 - 2D
 - 3D
- Iris
- Retina
- DNA
- Ear geometry
- Vascular Pattern
- Voice
- Odor



Access Control Terminal



Physiological Biometrics /2

Disadvantages:

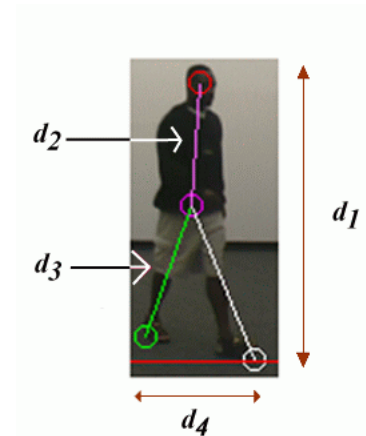
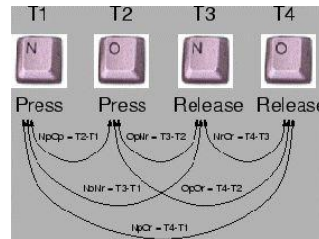
- Possibility of fraud
 - Spoofing
 - Silicon finger(print)
 - Forged photo
 - Copied iris image
 - Look-alike fraud
 - Criminal elements
 - Chopped-off fingers
 - Forced cooperation of victims

Possible solutions:

- Liveness detection
 - Detect non-living human tissue
 - Detect non-human tissue
- Supervision
 - Human inspection
- Behavioral analyses
 - Detect 'nervous' behavior

Behavioral biometrics /1

- Keystroke
- Gait
- Signature
- Voice



Does anybody recognise this man??

Source: <http://www.cleese.co.uk/portfolio.html>

Behavioral biometrics /2

- Disadvantages:
 - Recordable
 - Changes over time
 - Easy imitation

- Possible solutions:
 - Interactive authentication
 - Re-enrolment

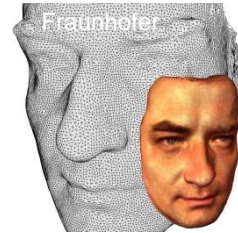
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Developments in Biometric technologies

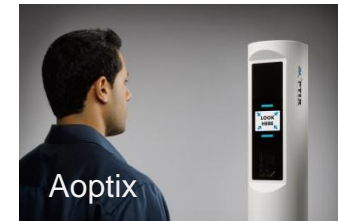


Developments in Biometric technologies

- Biometric sensors evolutions
 - Improved image resolution, capture speed
 - More and more 3D sensors



- Capture biometric data at a distance
- Capture biometric data in motion



- Improved liveness detection
- Easier to use



Developments in Biometric technologies

- Multimodal sensors
 - Iris/face camera
- Sensor Fusion
 - Fuse images captured by different sensors and create a single mathematical model (e.g using wavelet decomposition).
 - Requires new matching algorithms
- New biometric modalities
 - Vascular (vein) biometrics
 - Sweat pore
 - Skeletal biometrics
- Match score fusion
 - Fusion of multiple different matching results
- Improved and New algorithms

Trends in technology

- Technology evolved over a very, very long time
- At the end of the 1990's technology reach a level of maturity that allowed using it in real life
- New technology emerges steadily, existing technologies evolve quickly
- Since 2000, public and commercial applications appear.
- Biometric technology has become mature!

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Trends



Disruptive trends

- **Cloud Computing**
 - Private cloud computing is being adopted on a wider scale in enterprise IT organisations, both on premises and as a Hosted private cloud
- **Social Computing**
 - The use of social computing technologies for infra and inter company collaboration is expanding, so employees begin to prefer these methods of communication
- **Consumerisation of IT**
 - IT Organisations are being forced to adopt mainstream consumer technologies to satisfy a growing tech savvy employees



Key disruptive trends are creating new opportunities for IT to deliver value to the business – enabling a step-change in productivity via new styles of interaction, automation and service delivery

End User Focused

- Consumerisation of IT



... will continue to accelerate within enterprise environments, as Cloud and new generations of **powerful consumer mobile devices** proliferate

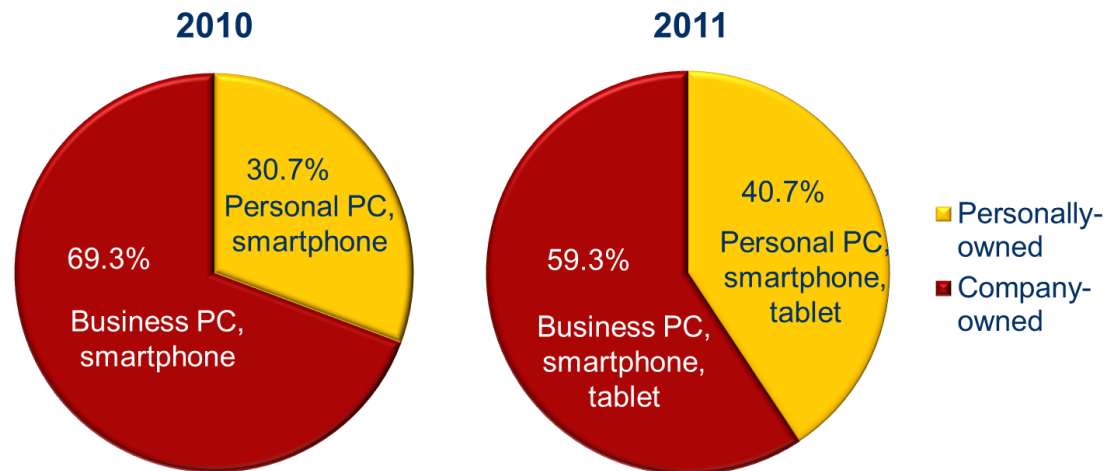
... will accelerate as tech aware business increasingly look to intermingle work and personal activities on their own high end technology

... will result in significant changes to end-user and customer interaction support requirements of the enterprise

Consumer devices are *already* in the enterprise

iWorkers are increasingly dependent upon more devices (more types of devices and more personally acquired devices) to get their work done

Devices Used to Access Business Applications



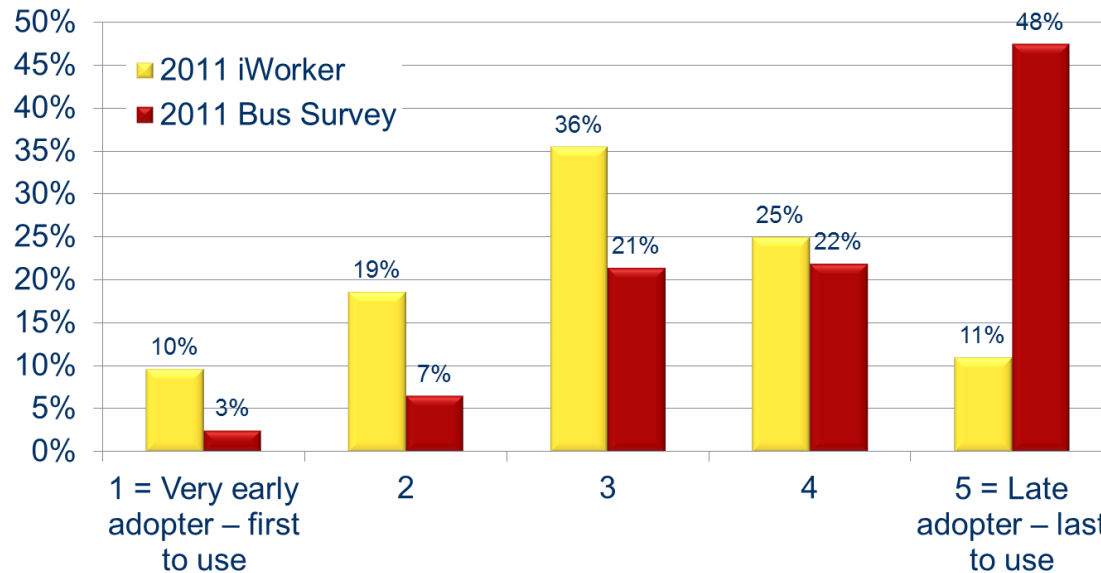
- 40.7% of the devices used by iWorkers to access business applications are ones they own themselves, including home PCs, smartphones, and tablets such as Apple's iPad. This is up 10 points from last year's study in which 30.7% of the devices iWorkers used to access business applications were personally-owned.
- Over 30% of iWorkers use personally owned PCs for work, and nearly 10% reported using their personal tablet for work – a device that did not even exist just 15 months ago.

Source: Information Worker Custom Survey, Sponsored by Unisys, May 2011 and May 2010 Q1 (2011); Q4 (2010). Which, if any, of the following devices do you use to access your organization's business applications such as employee benefits, customer billing, client relationship tools, or productivity tools such as spreadsheets, word processors, etc.?

IT sees itself as a custodian of legacy, not a business innovator

70% of IT decision-makers rated their organizations as moderately late or “last to use” adopters of new technology

Rating of Self/Department in Terms of Technology Adoption



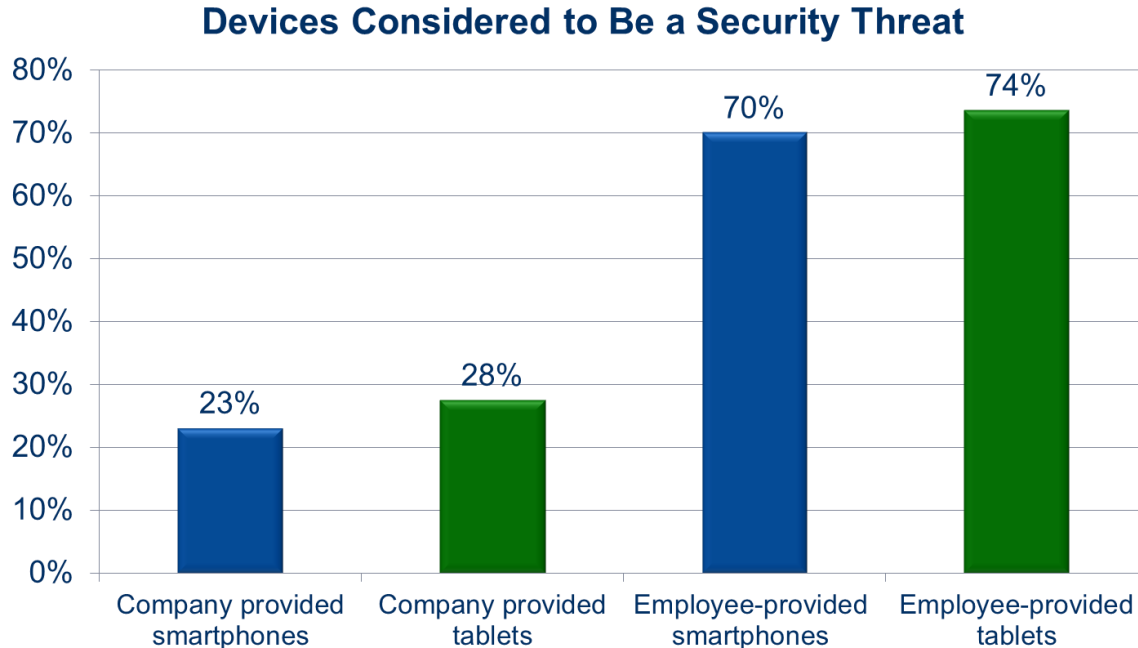
- iWorkers rate themselves as technology adopters along a bell curve -- while nearly half of IT respondents rate their department as late adopters/last to use technology 10% of iWorkers say they are early adopters/first to use, a few are late adopters/laggards, with the vast majority sitting somewhere in between.
- In contrast, nearly half of IT respondents rate their department as late adopters/last to use technology, with a very small percent calling themselves early adopters.

Source: Information Worker Custom Survey, Business IT Survey, Sponsored by Unisys, May 2011

(iWorker survey) Q17. How would you rate yourself in terms of your own adoption and use of technology? Please use a scale of 1 to 5 where 1 means you are a "very early adopter - first to use" and 5 means you are "late adopter - last to use"; (business survey) Q10. How would you rate your organization in terms of adoption and use of social networking applications and use of consumer-oriented devices such as smartphones, iPhones, tablets, etc for business purposes?

Security: IT sees a huge gap in device security

IT perceives employee-provided devices to be the major threat



- 70%+ of IT respondents believe employee-provided smartphones to be a threat and an even greater 74% believe employee-provided tablets are a threat.
- Threats from company provided smartphones and tablets are seen to be much less.

Market Drivers

- Drivers for using biometric technology
 - Cost reduction
 - Manual Identification or identity verification is time consuming
 - Biometrics enable self service business delivery when identity must be known
 - Convenience
 - Biometrics can not be lost
 - Biometrics cannot be forgotten
 - Biometrics are hard to copy
 - Security
 - Biometrics improve the level of certainty of the identity of individuals
 - Prevention of ID fraud

Large scale adoption of biometrics

- Large scale biometric solutions are designed to serve large populations of users.

– Examples:

- EU VIS
- India UID
- EU e-Passport
- Automated/Assisted Border Control Systems
- Biometrically enabled airport processes
- Biometrically protected Electronic Patient Files
- Etc. etc.



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Summary and Conclusion



Summary and conclusion

- Biometrics have taken a long time to mature
- One the technology became useful in the 90's, small scale applications emerged
- New biometric technologies evolved at a high pace, and enable improved security, convenience and efficiency in large scale applications. This will continue
- The fast adoption and penetration of Cloud computing, social computing and consumerisation of IT offer great opportunities
- Biometrics can be used to secure the IT of the future, and it will.

Thank You!

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