ACUITY
MARKET INTELLIGENCE

Biometrics 2004
Advanced Seminar Part II

Biometrics Industry Evolution

From Emerging Core Technology to Integrated Solution Framework

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ACUITY MARKET INTELLIGENCE

Acuity Market Intelligence cuts through the clutter of information overload to provide *technology-neutral* and *vendor-independent* insight, analysis and solutions assessment for emerging technology markets.

Markets	Identification Solutions, Biometrics, Authentication
Clients	Vendors, Targeted Solution Providers, Integrators, End Users
Services	Market Analysis & Strategic Consulting Market Identification, Segmentation and Sizing Targeted Opportunity Analysis Technology Adoption & Deployment Evaluations

Seminar Objectives

Context

What will it take to transform biometrics from a loosely associated grouping of emerging technologies to a broad based integrated framework for large-scale identification solutions?

Audience

Vendors, Targeted Solutions Providers, Integrators, End Users

Take Aways

1) Understanding – from both technological and societal perspectives – of the drivers and obstacles to the evolution of the biometrics industry

2) Familiarity with analysis tools and methodologies designed to support the development of socially *acceptable* biometrically enabled identification solutions

3) Impact of emerging technology environment - convergence of digital image capture devices, generic pattern matching algorithms, digital rights management, distributed network architectures

Seminar Agenda

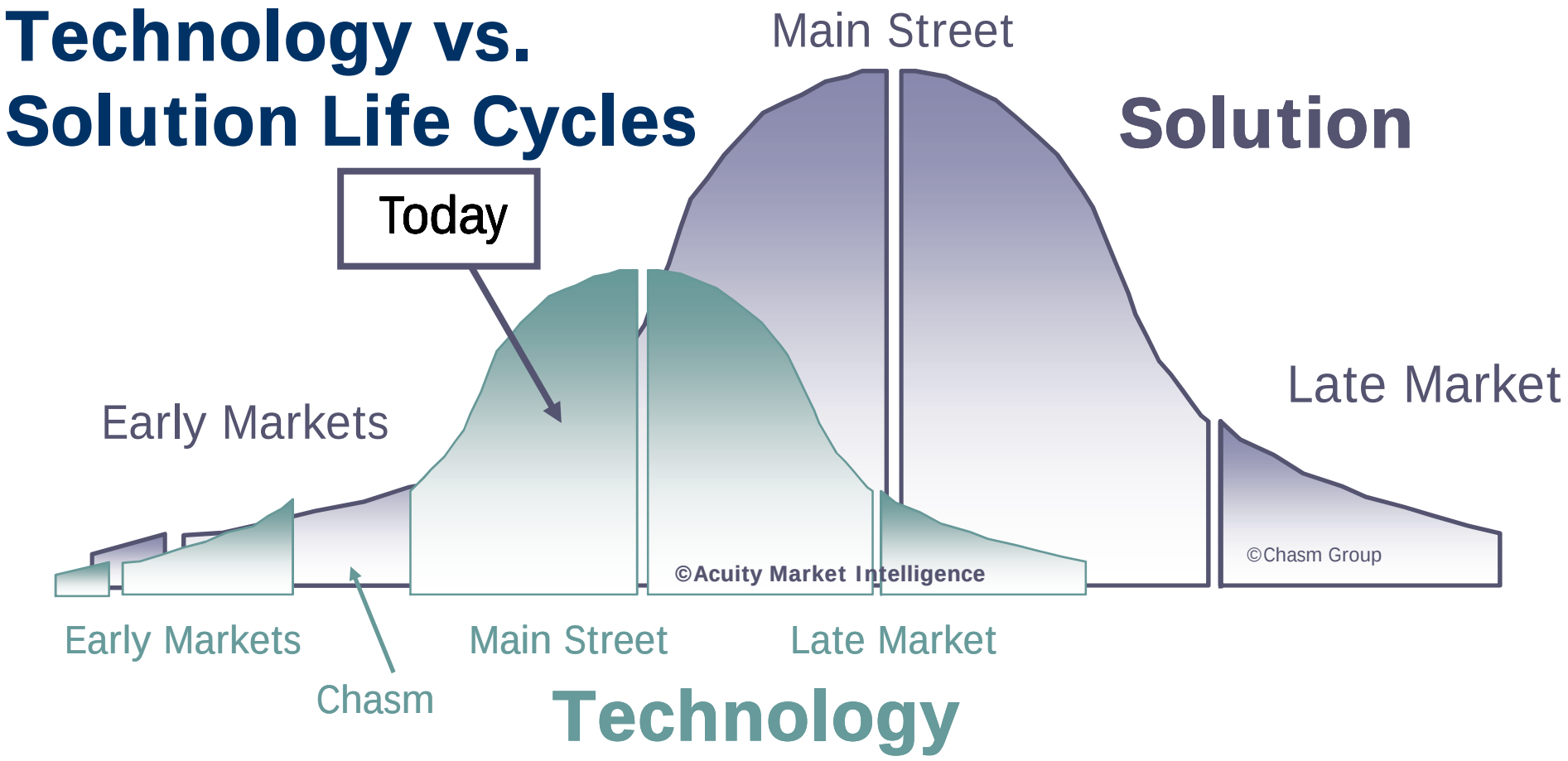
- **Part I: Market Evolution Context**
  - Technology vs Solutions Adoption Lifecycle
  - Public Sector and Commercial Market Evolution
  - State of the Market – Evolution Drivers & Obstacles
- **Part II: Solutions Development Model**
  - Whole Product Solutions
  - Building the Value Chain
  - Constructing a Solution
  - Solutions Development Map
- **Part III: From Technology to Solutions**
  - Solutions Development Progress
  - Key Initiatives & Actions
  - Emerging Technology Environment

Part I: Market Evolution Context

- **Technology vs Solution Adoption Lifecycle**
- **Public Sector & Commercial Market Evolution**
  - Key Public Sector Markets
    - Integrated Border Management
    - eID
    - eGovernment
  - Key Commercial Markets
    - Enterprise Physical & Logical Access
    - Information Transactions
    - Financial Transactions
- **State of the Market: Evolution Drivers & Obstacles**

Solution Adoption Framework

For enabling technologies like biometrics, the **Solution Adoption Lifecycle** hits the Tornado as the **Technology Adoption Lifecycle** peaks in the Mainstream

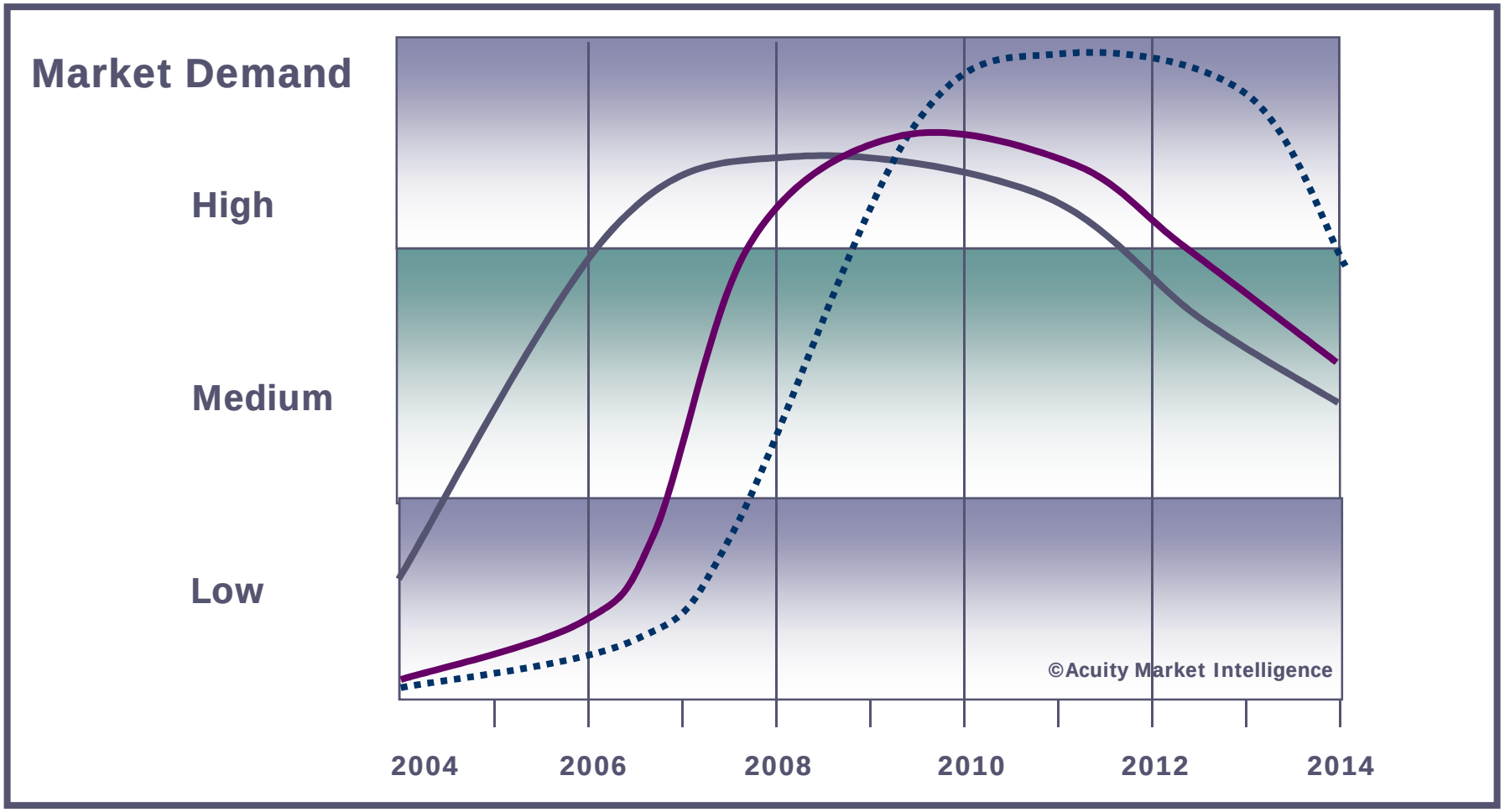


Public Sector Market Evolution

Integrated eBorders — passports, visas, border control

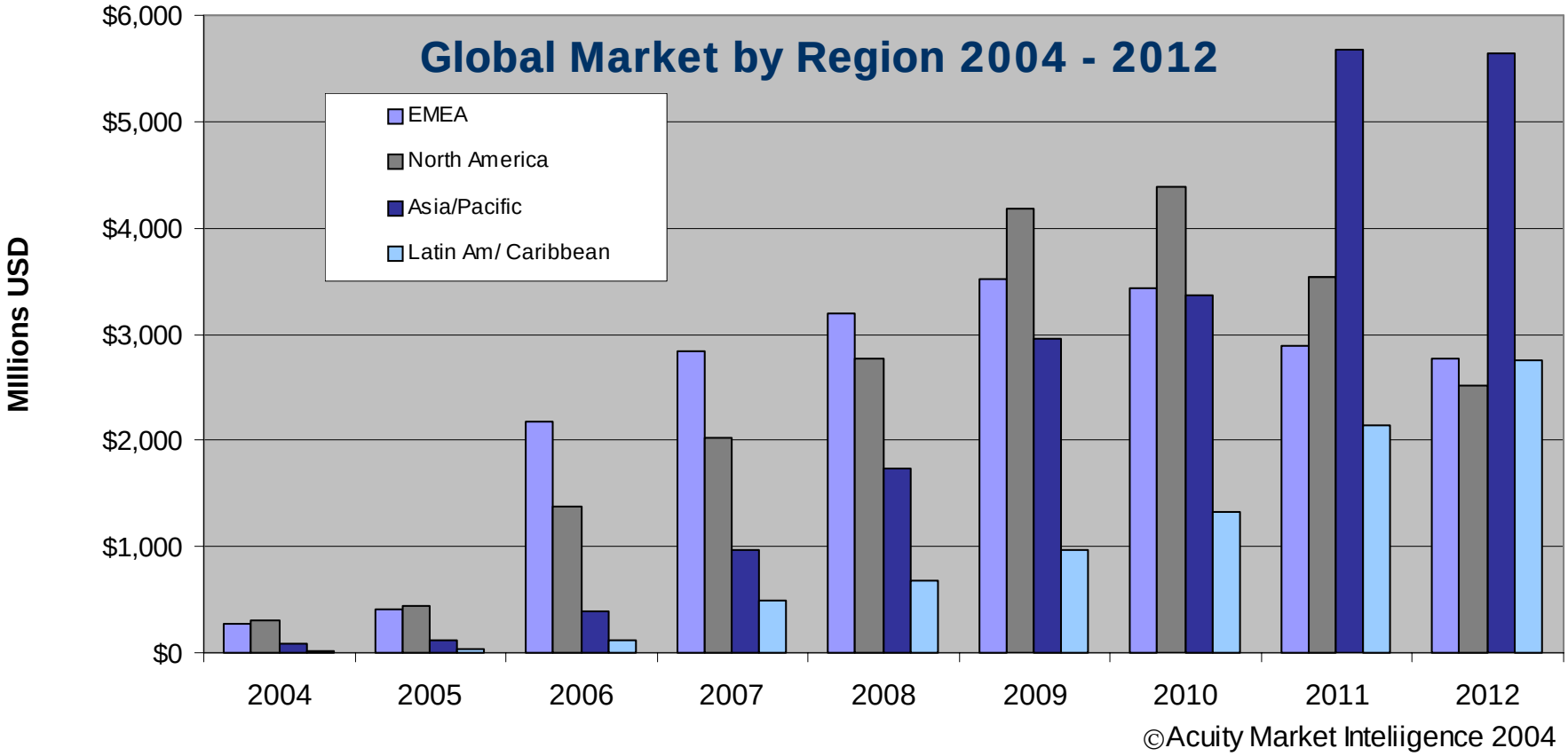
eID — National IDs, ID Cards

eGovernment — ID verification, electronic access



Public Sector Market Forecast

Worldwide Projection for Integrated Border Management - Total Solutions



Public Sector Market Forecast

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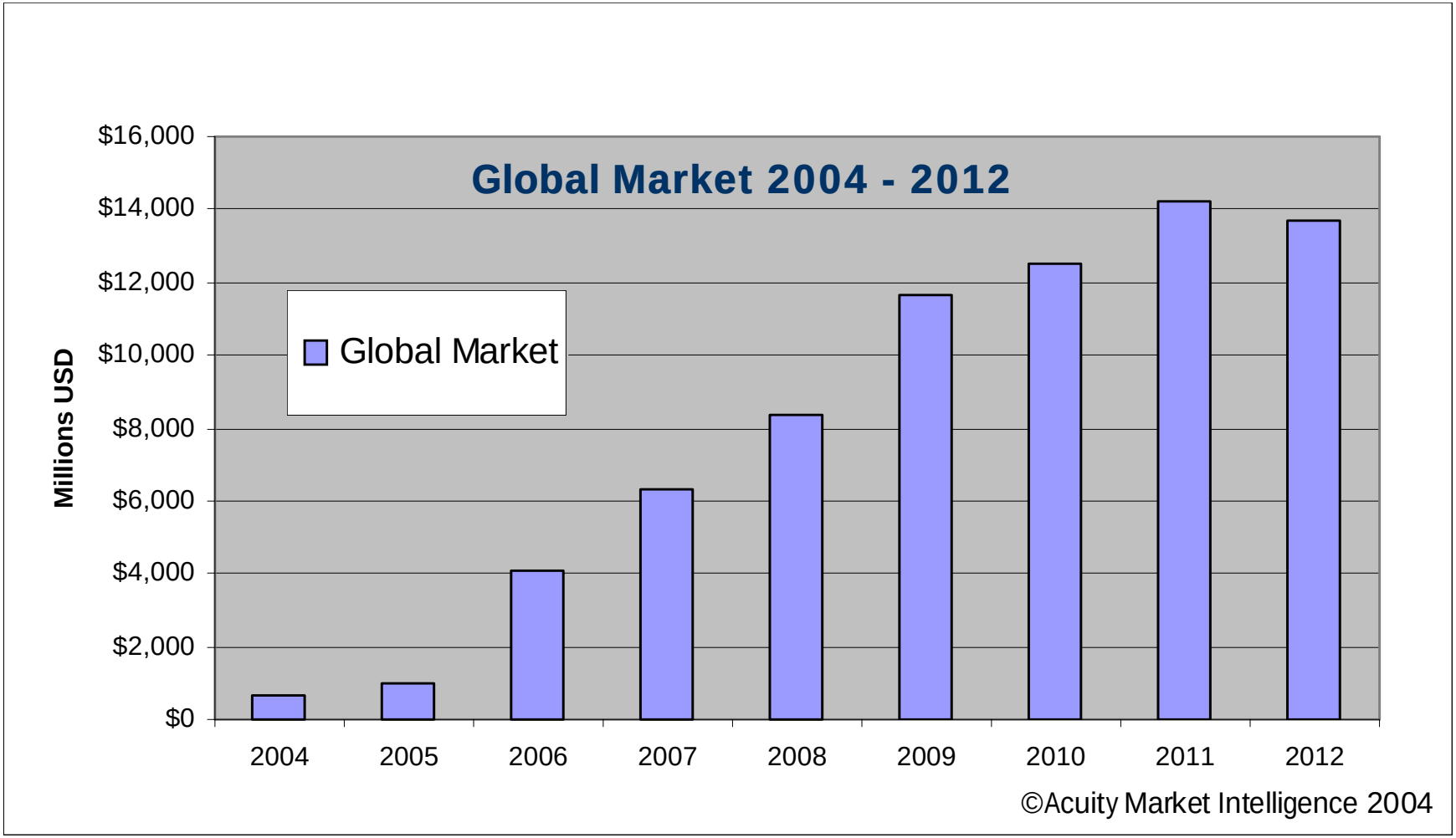
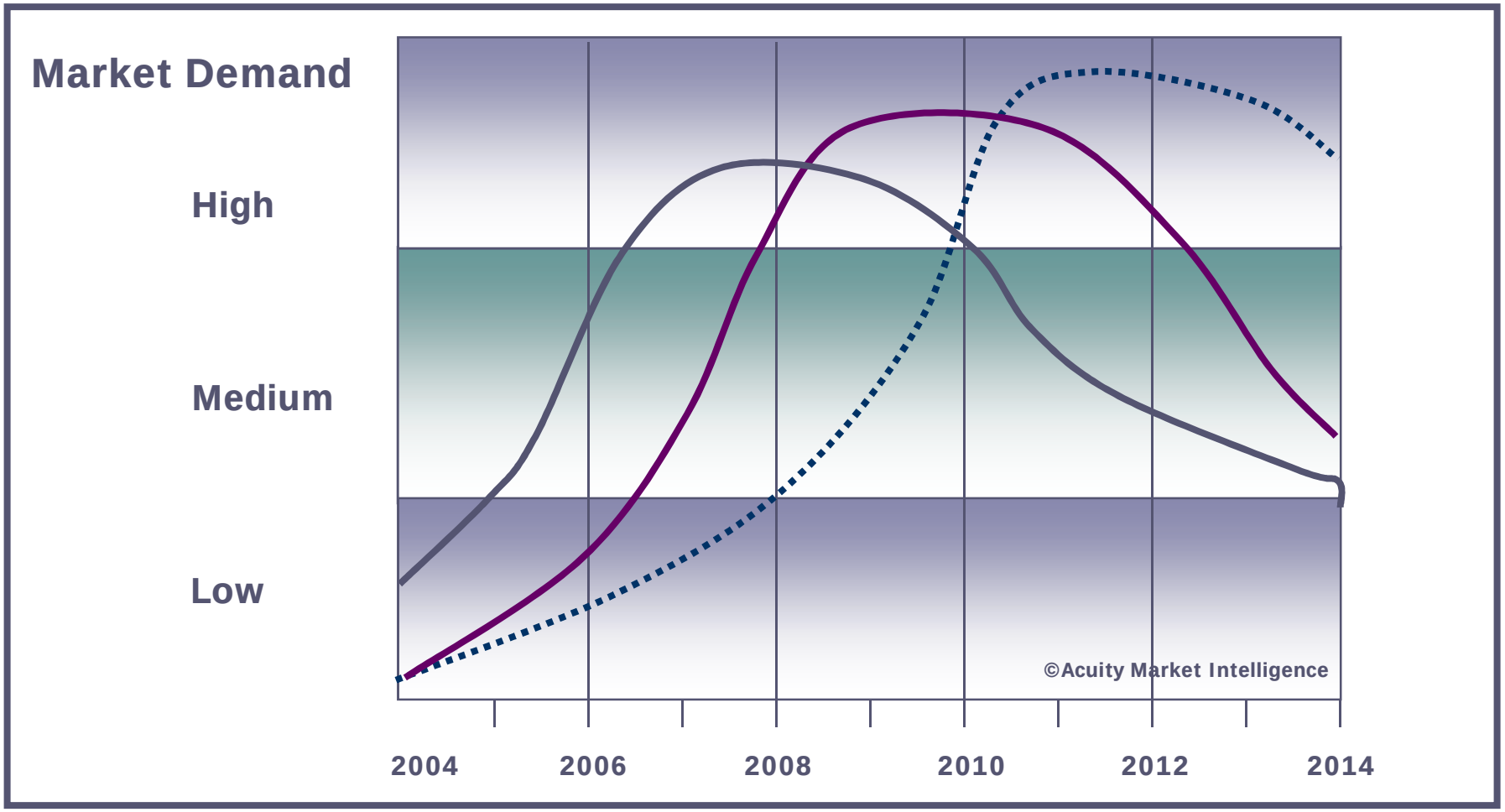


Commercial Market Evolution

Enterprise Security
physical & logical access

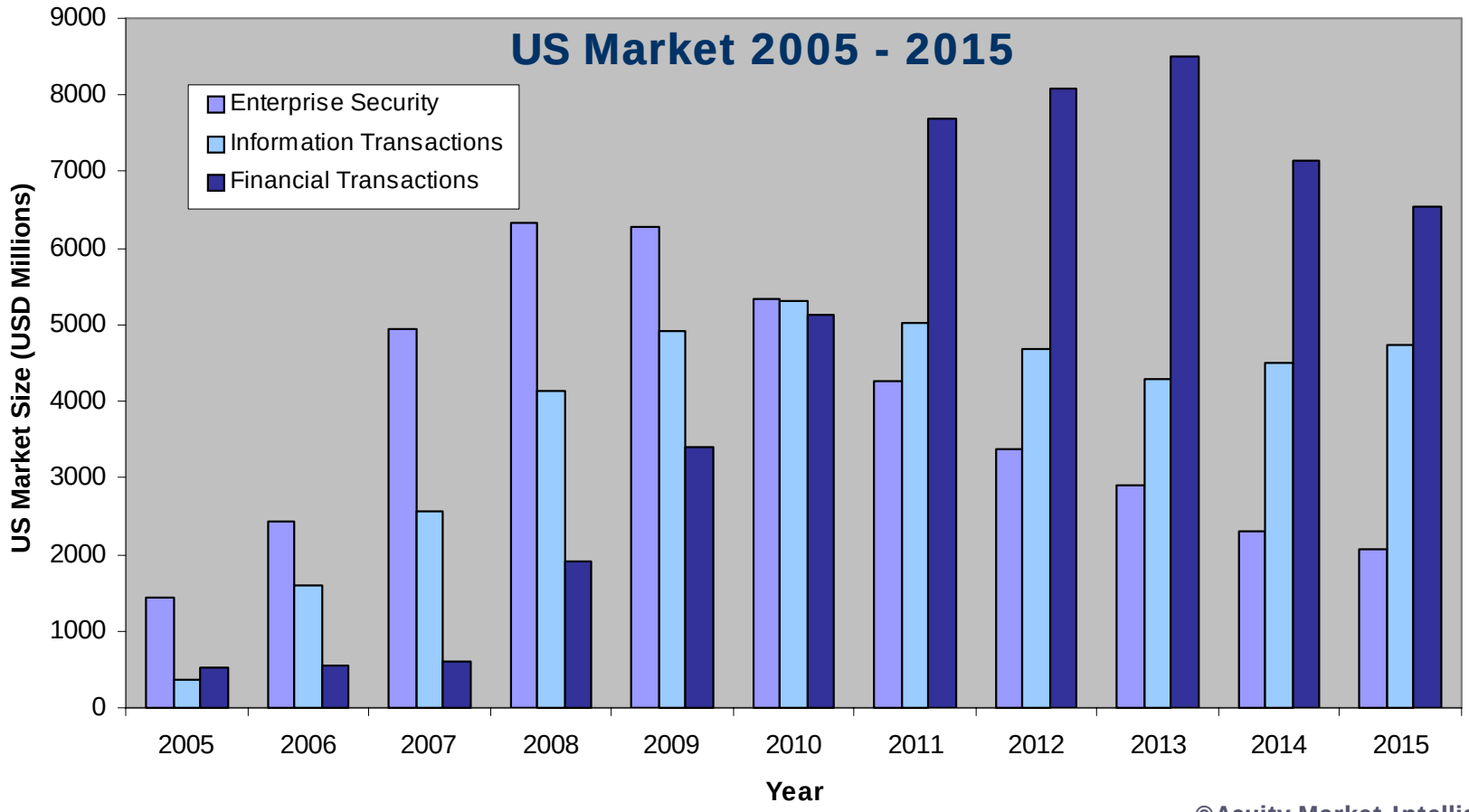
Information Transactions
IP, accounts, private data

Financial Transactions
POS, electronic payments



Commercial Market Forecast

US - Total Solutions Projection for Commercial Markets
Enterprise Security, Information Transactions, Financial Transactions



State of the Market

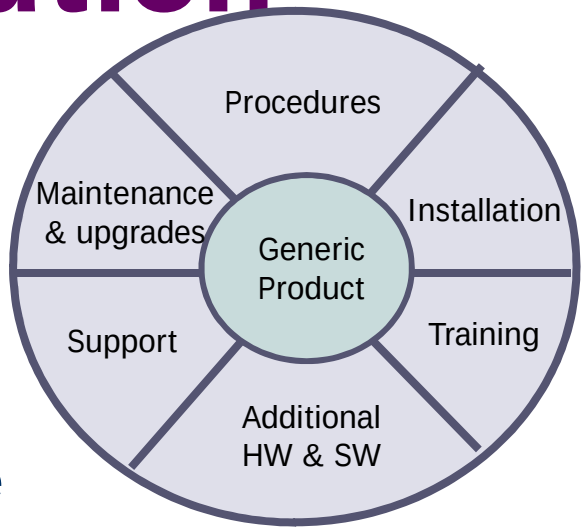
Evolution Drivers and Obstacles

	Public Sector		Commercial	
Factor	**Driver**	**Obstacle**	**Driver**	**Obstacle**
Post 9/11, 3/11 Terrorism Fears	X		X	
US-VISIT	X		X	
Improved Gov Services – cost/efficiency	X		X	
9/11 Commission Endorsement	X		X	
ICAO, ILO Endorsement	X		X	
EU Interior Ministers Endorsement	X		X	
EU Expansion Borders – Secure Mobility	X		X	
IATA pursuing 100% eticketing by 2007	X		X	
Identity Fraud & Theft	X		X	
Financial Transaction Fraud	X		X	
Information Security	X		X	
Password Fatigue	X		X	
Data Protection/Privacy Concerns		X		X
Big Brother		X		X
Misrepresentations by Industry, Press		X		X
Industry Fragmentation		X		X

Part II: Solutions Development Model

- **Whole Product Solution**
- **Building the Value Chain**
  - From Core Technology to Total Integrated Solution
  - Sizing the Value Chain
- **Constructing a Solution**
  - Solution Components – Engineering, Industrial Design, Human Factors, Information Infrastructure, Legal & Regulatory
- **Solutions Development Map**

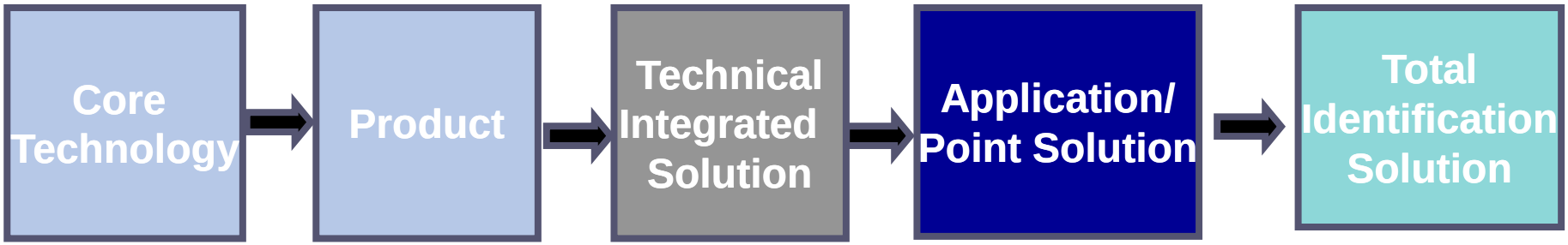
Whole Product Solution



- Bridge Gap Between Value Proposition and Delivered Product
- Complete Set of Products & Services for Customer to Achieve Results
  - Generic - defined in purchase agreement
  - Expected – minimum to achieve buying objective
  - Augmented – maximum chance of meeting buying objective
  - Potential – incorporates ancillary products & enhancements
- Tangibles & Intangibles - tools, methodologies, 3rd party relationships, performance benchmarks, reputation as a standards-driver, perceived market clout
- Development of whole product solution is complex, time- and resource-intensive
- Robust whole product solution creates formidable competitive barriers

Building the Value Chain

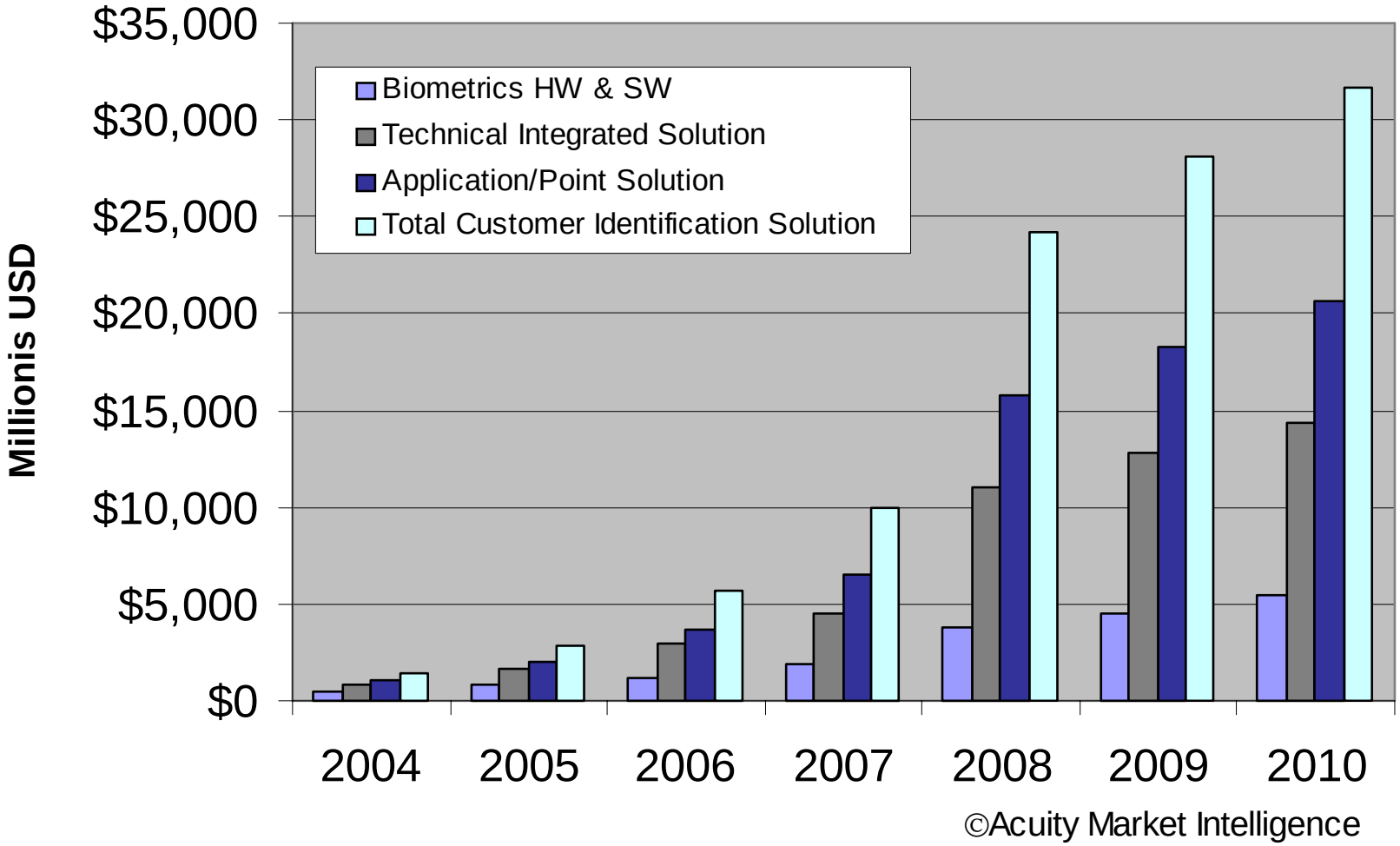
From Core Technology to Total Identification Solution



Core Technology	Product	Technical Integrated Solution	Application/Point Solution	Total Identification Solution
Biometrics hardware and software including sensors, devices, template generation , and pattern creation and matching algorithms.	Off-the-shelf biometric products including door locks, PC peripherals, mobile ID devices and other various physical and logical access products	All the interface, network and integration software and services required to ensure the proper installation and functioning of the biometric core technology including core technology.	A complete *small scale* integrated solution including design, development, consulting, deployment, service and support including integrated technical solutions and core technology.	A compete *large scale* integrated identification solution including design, development, consulting, deployment, maintenance, service and support including integrated technical solutions and core technology and possible incorporating one or more application/point solutions.
Swipe Sensor	Access Control Device	Facility Access	Facility Physical & Logical Access	Enterprise-wide Physical & Logical Access

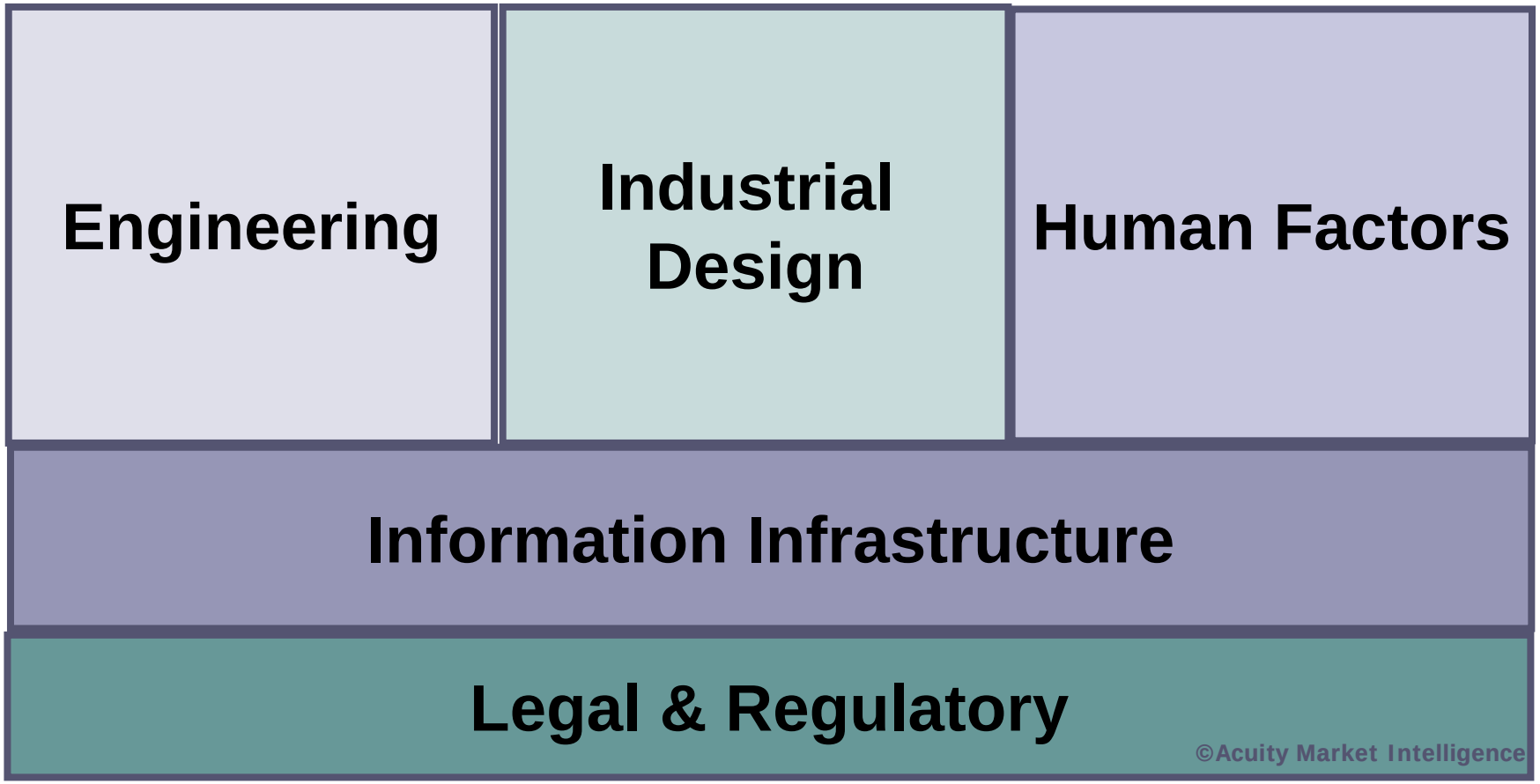
Sizing the Value Chain

Biometric HW & SW forecast is median of published numbers from IBG, IDC, Frost & Sullivan
Biometrics HW & SW includes Core Technology and Products



Constructing a Solution

Components of a Biometrically Enabled Solution



Constructing a Solution

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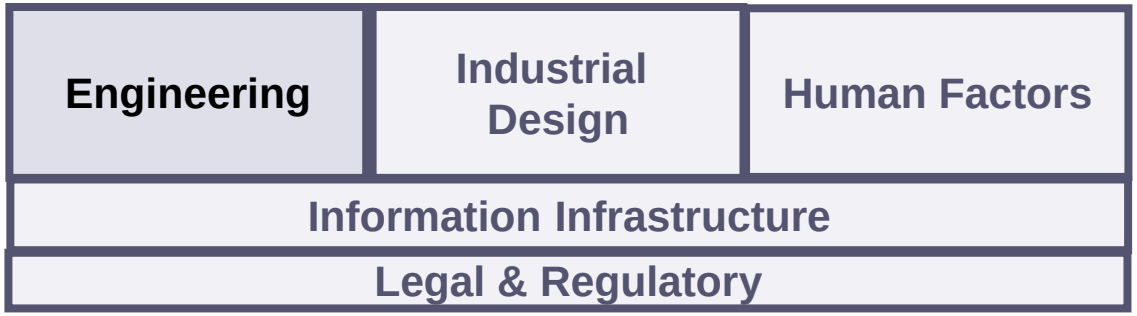
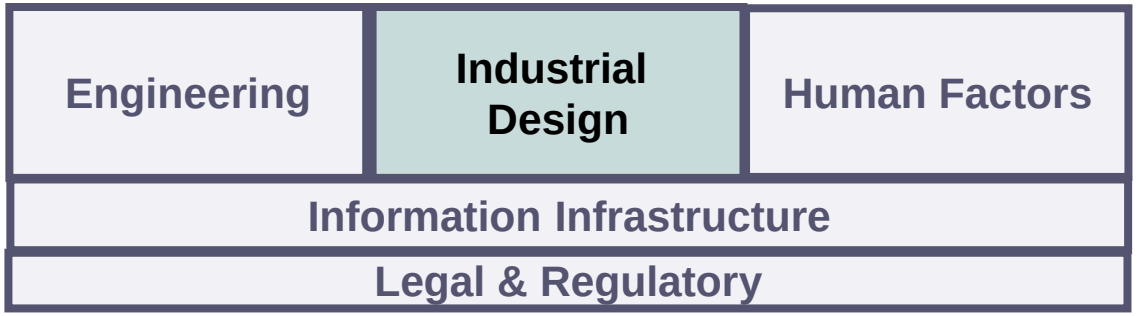


- **Functional Specification**
  - Technical & System Performance Requirements
  - Process Flow & System Design
- **Standards Compliance, Best Practices**
- **Data Management**
- **Interoperability, Scalability**
- **Legacy & Future System Integration**
- **Implementation & Testing Methodology**

Constructing a Solution

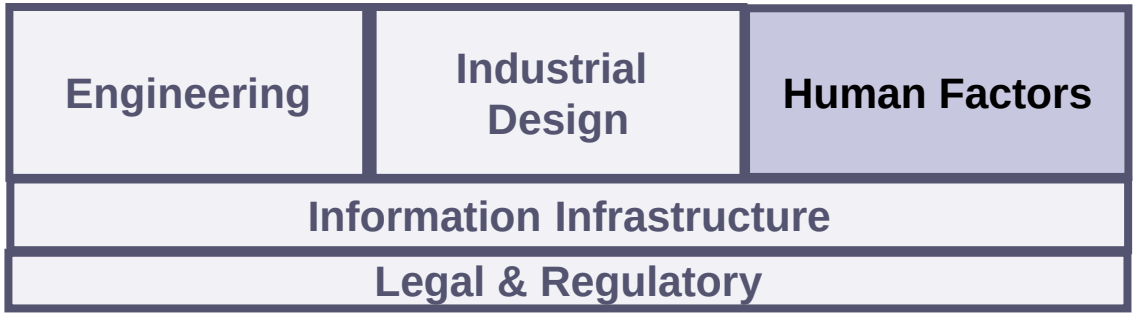
Components of a Biometrically Enabled Solution



- **Look and Feel**
- **Environmental Concerns**
- **Disability Compliance**
- **Functional Conflicts**

Constructing a Solution

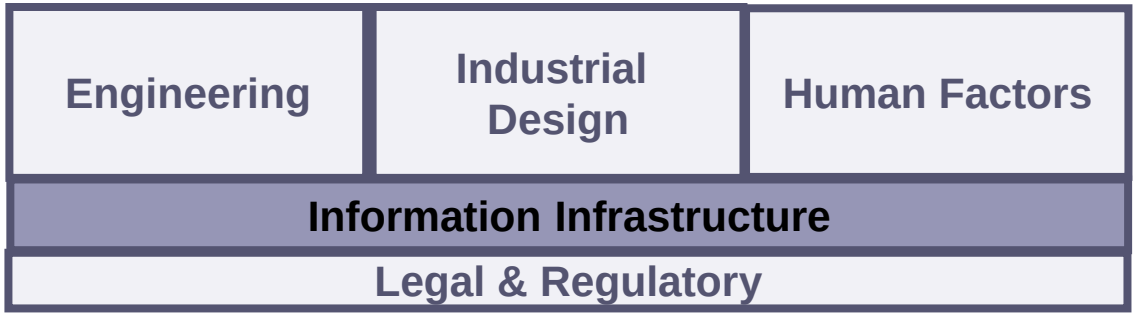
Components of a Biometrically Enabled Solution



- **Human / Machine Interface**
- **For All Constituents - End Users, Design, Support and Maintenance Staff, Operators**
  - Ease of Use
  - Intuitiveness
  - Acceptability
  - Convenience
  - Ergonomics

Constructing a Solution

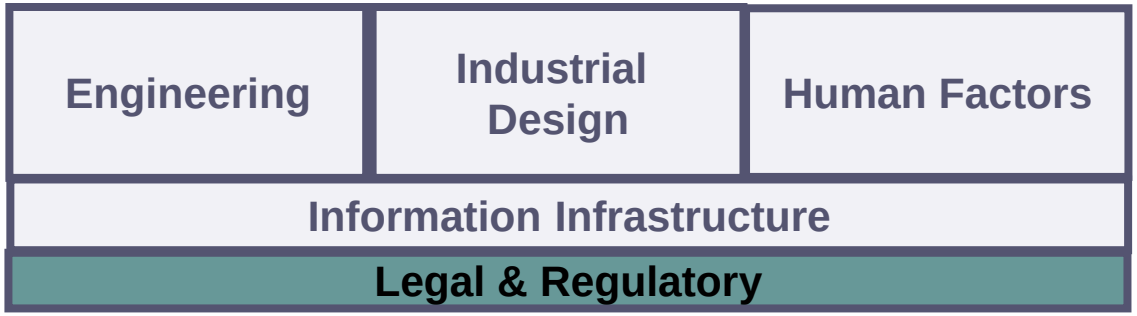
Components of a Biometrically Enabled Solution



- **For All Constituents - End Users, Design, Support & Maintenance Staff, Operators**
  - Business Process Management
  - Content Management
  - Communications – Internal/External
  - Integration with Existing Data Management
  - Integration with Other Programs/Projects
  - Security, Privacy and Data Protection Policies, Roles & Responsibilities
  - Education and Training
  - Globalization & Localization

Constructing a Solution

Components of a Biometrically Enabled Solution

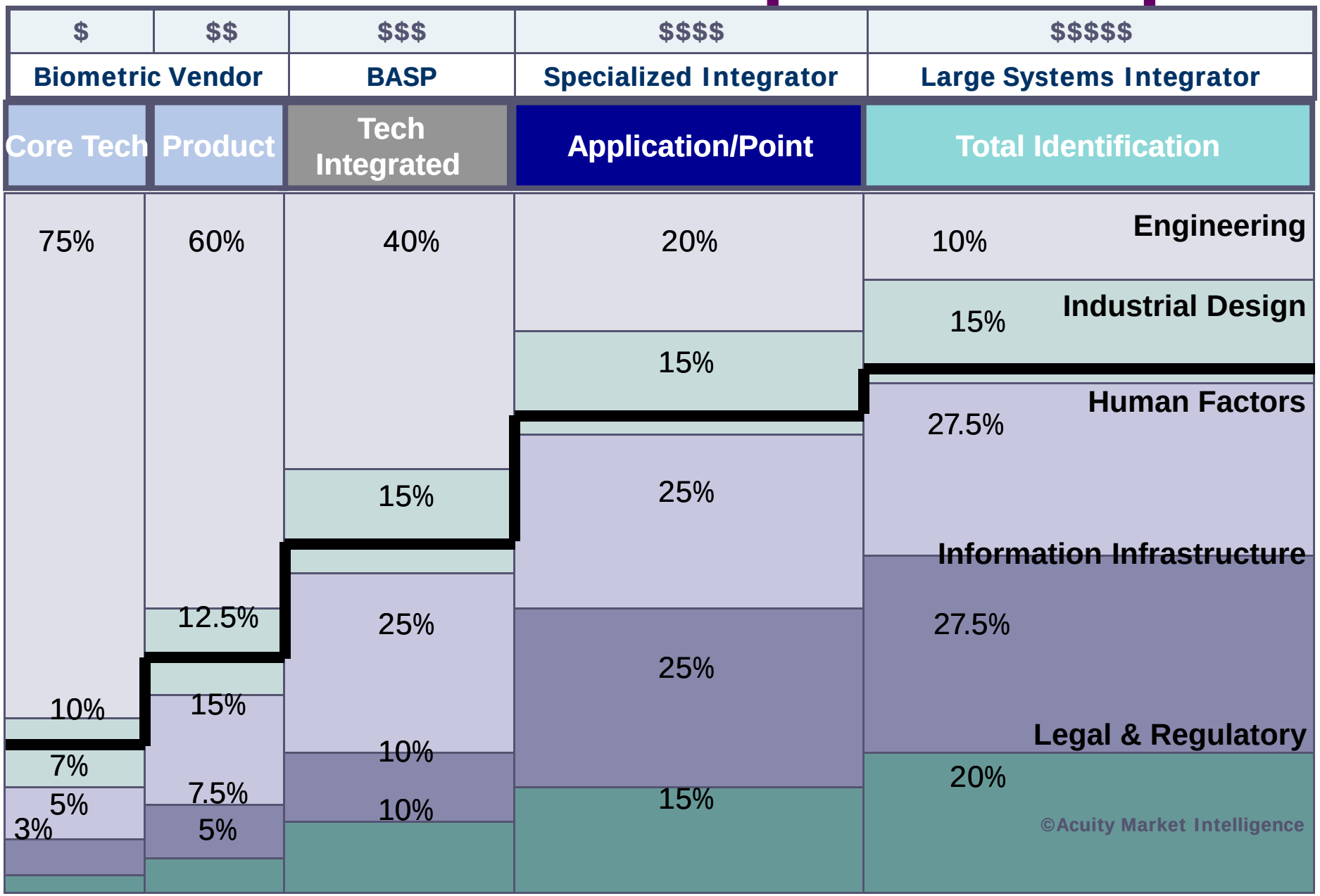


- **Local and International Compliance For All Constituents - End Users, Design, Support and Maintenance Staff, Operators**
  - Privacy
  - Data Protection
  - Civil Liberties

Value Chain Revenue Analysis

$	$$	$$$	$$$$	$$$$$
Biometric Vendor		BASP	Specialized Integrator	Large Systems Integrator
Core Tech	Product	Tech Integrated	Application/Point	Total Identification

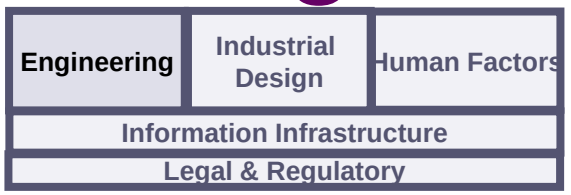
Solutions Development Map



Part III: From Technology to Solutions

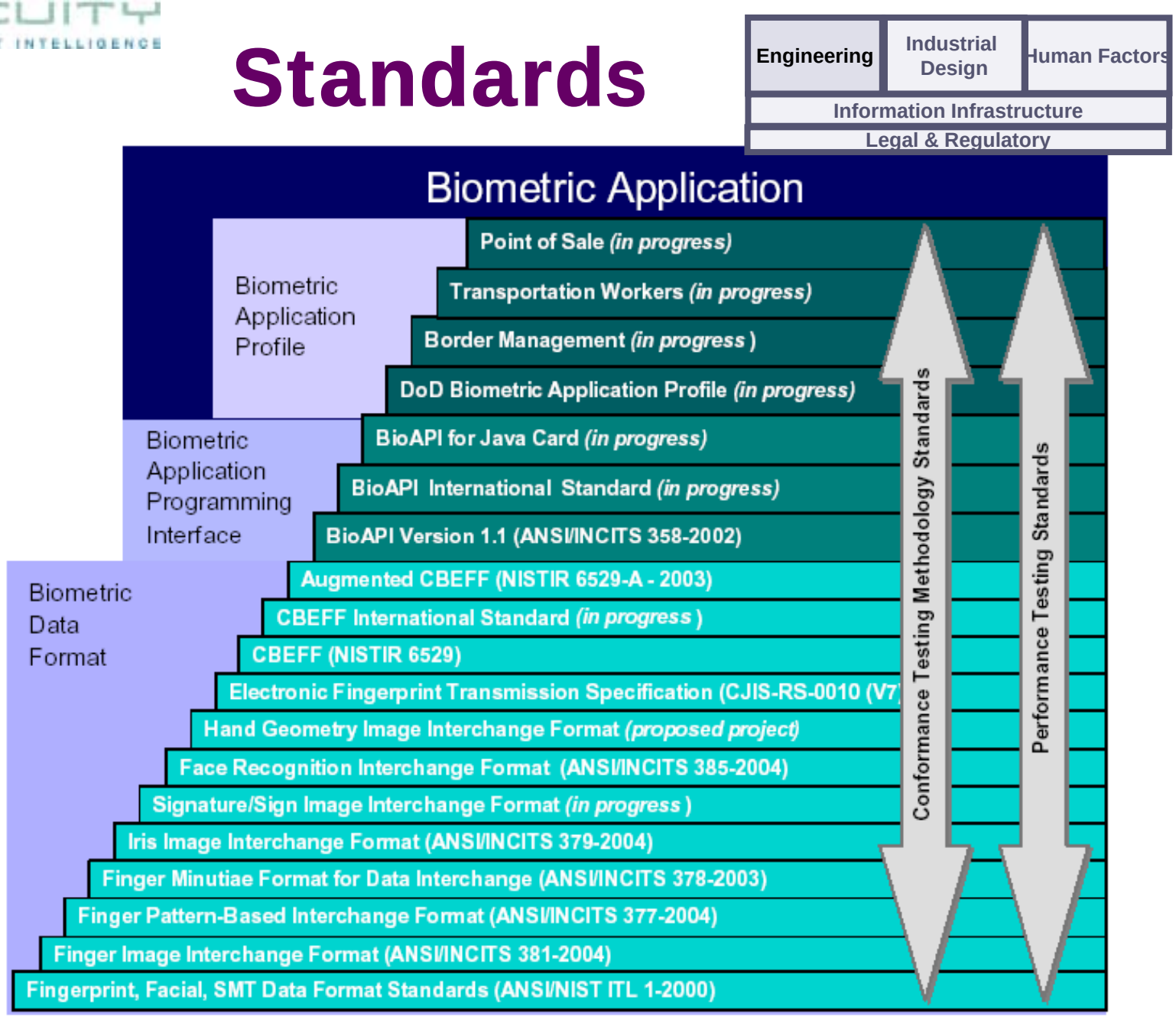
- **Solutions Development Progress**
  - Engineering
  - Industrial Design
  - Human Factors
  - Information Infrastructure
  - Legal & Regulatory
- **Key Initiatives & Actions**
  - Standards
  - Public Policy
  - Government Programs – R&D, pilots, tests
- **Emerging Technology Environment**

Solutions Development Progress
Engineering



- **Functional Specification** – current industry models applied, performance improving and will continue to do so though consistent measurement criteria not established
- **Standards Compliance** – emerging
- **Best practices** – early stages, generally being established within organizations not across industry
- **Data Management** – need safeguards, remedial actions, comprehensive frameworks
- **Interoperability** – not yet supported
- **Scalability** – requisite knowledge does not exist
- **Legacy & Future System Integration**
- **Implementation & Testing Methodology** – mostly ad hoc, some learning's carried over within organizations

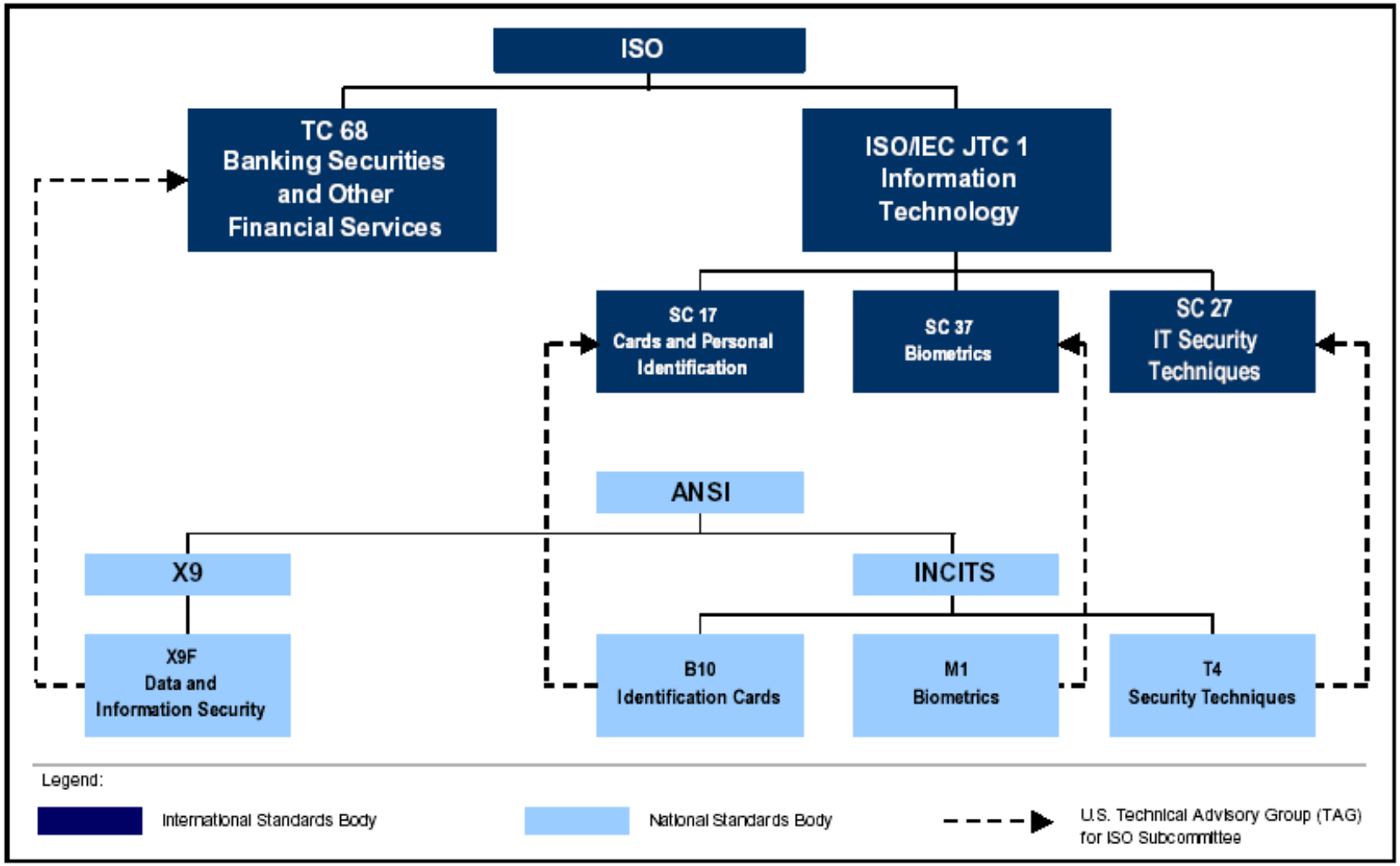
Standards



Source: DoD BMO Report on biometrics Standards

Standards

Engineering	Industrial Design	Human Factors
Information Infrastructure		
Legal & Regulatory		



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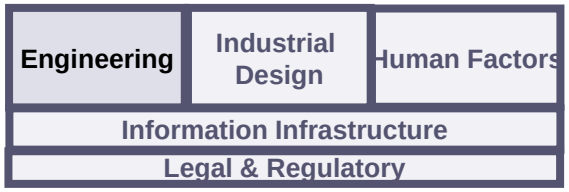
Standards

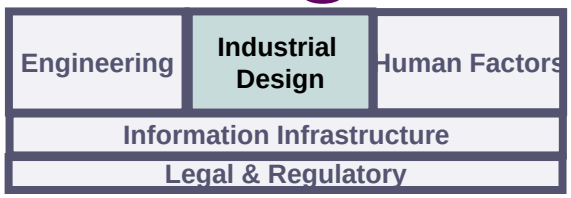


- **Explosion in biometric standards activity accelerating standardization process**
- **Standards activity indicators of widespread interest in biometrics**
- **Standards requirements of market evolution**
- **Standards**
  - Provide flexibility
  - Drive biometrics to a commodity
  - Make biometrics plug-and-play
  - Lower implementation risk

Source: Casthy Tilton, BC 2004 Presentation

Solutions Development Progress

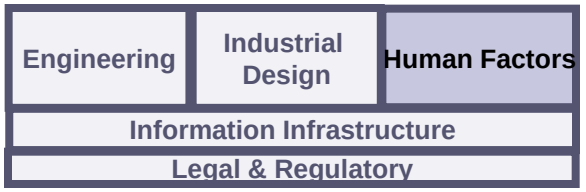
Industrial Design



- **Look and Feel** – most solutions are being "kluged" together
- **Environmental Concerns** – considered on a case by case basis
- **Disability Compliance** – very few true tests
- **Functional Conflicts** – too often discovered after going live

Solutions Development Progress

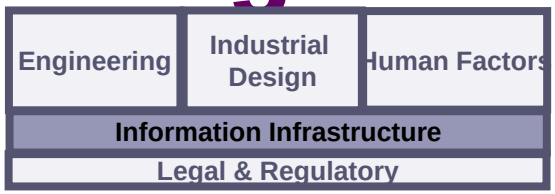
Human Factors



- **Human/Machine Interface**
  - Ease of Use
  - Intuitiveness
  - Acceptability
  - Convenience
  - Ergonomics
- **For the most part NON–EXISTENT**
- **Generally handled on an ad-hoc basis by technology providers with little or no expertise**
- **Non end users notably excluded**
- **Will be CRUCIAL ISSUE(s) as solutions development progresses**

Solutions Development Progress

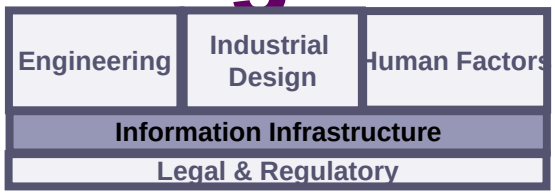
Information Infrastructure



- Generally NOT CONSIDERED a specific area of concern
- Components grouped within other areas of solution
- Non end users notably excluded

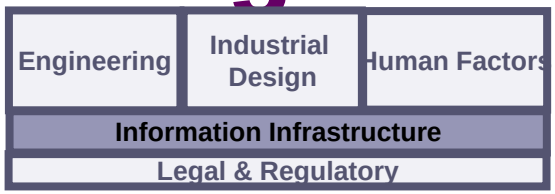
Solutions Development Progress

Information Infrastructure



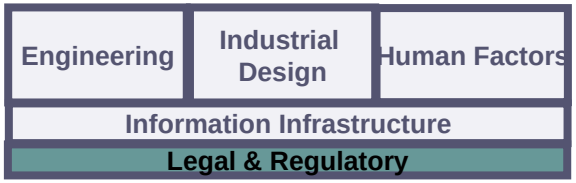
- **Business Process Management** – existing tools may prove inadequate
- **Content & Content Management** – end user, operator, support & maintenance staff
- **Communications Internal/External** – to date objectives and expectations are not clear, processes vague
- **Integration with Existing Data Management** – mixed success from technological perspective, hiccups from societal perspective
- **Integration with Other Programs/Projects**
- **Security, Privacy and Data Protection**
  - US-VISIT Privacy Directive caveats make it ineffective
  - EU Data protection Working Group raising strong objections
  - Privacy advocates attacking in principal and specific programs

Solutions Development Progress
Information Infrastructure



- **Education and Training** – inadequate. Often due to rushing to deployment CRITICAL FOR USER ACCCEPTANCE
- **Globalization & Localization** – some work in this area but mostly around technology and standards, great potential for confusion and inefficiencies (especially cross border) if not addressed particularly with regard to Communications & Content & Business Processes

Solutions Development Progress
Legal & Regulatory

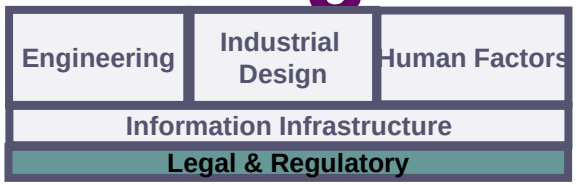


- **Local and International Compliance**
  - Privacy
  - Data Protection
  - Civil Liberties
- **EU Leads the World in Framework Development**
- **US–VISIT Requirements Adversely Impact Existing Laws and Regulations**
- **Privacy Advocacy Targets**
  - Multi Use ID Programs
  - Lack of Explicit Privacy/data Protection Policies
  - Unfettered International Cooperation
  - Industry Associations Setting Policy
- **Standards for Privacy Enhancing Use of Biometrics Need to Be Established**
- **Industry MUST CHAMPION**

Solutions Development Progress
Legal & Regulatory

- **"Big Brother" is the Worst Case Scenario**
  - ICAO letter from 30+ Civil Liberties & Human Rights groups
    - Extreme objection to centralized databases
    - Local storage on a personally owned smart card not problematic
- **Towards Privacy enhancing Applications of Biometrics**
  - Separating the Database and Technology Issues
  - Verification versus Identification
  - Anonymous Identification
  - Function Creep

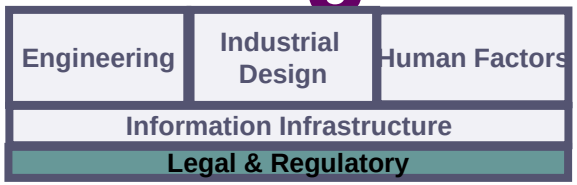
Solutions Development Progress
Legal & Regulatory



Guidelines for Privacy Enhancing Applications of Biometrics

- Separate centralized database issue from biometrics applications – massively interconnected, centralized digital databases are scary even with biometrics
- Keep storage of biometrics separate from personal data – If personal data must be linked use a distributed network computing approach
- Local storage of biometrics on personal devices (i.e. smart cards) should be used whenever possible
- Non-repudiated anonymous identification is powerful privacy enhancing application of the biometrics
- Biometrics should be applied as a means of protecting the privacy of an individual when bridging the human-machine identity gap

Solutions Development Progress
Legal & Regulatory



Guidelines for Privacy Enhancing Applications of Biometrics

- Privacy enhancing biometric applications should be designed to reduce the collection and processing of other personal data – name, address, gender, age, etc.
- Biometric matches or failures to match should always be verified through a human process so as not to falsely deny access to – physical or logical – or accuse any individual
- Security measures must be taken when biometric data is processed – enrolled, stored, transmitted, extracted, template generation, matching
- Enrollment processes must include an initial authentication process that prevents the linking of a forged identity to genuine biometrics
- International standards must be developed in conjunction with data protection authorities
- Clear and binding legislative/regulatory frameworks are required to ensure appropriate use of biometrics technology.

Key Initiatives & Actions

- EU based R&D particularly for interoperability
- Standards bodies making progress
- Industry associations working toward education, best practices, integrating fragmented market
- EU biometrics portal call for tender
- International cooperation on the passport front
- Privacy & civil liberties groups fully engaged
- EU data protection working group calling for more stringent control
- Large integrators strengthening commitments, taking more definitive action

Emerging Technology Environment

- **The Usual Suspects**

  Smart Cards, PKI, Digital Signatures, SSO, Identity Management

- **Up and Coming Areas of Interest**
  - Convergence of Digital Imaging - Generic Capture Devices & Pattern Recognition Algorithms
  - Digital Rights Management – Ownership and Management of Biometric Data
  - Distributed Network Computing – Identification at the Point of Access

Emerging Technology Environment
Digital Rights Management

- **Identity as a fundamental component of next generation global computing infrastructure**
- **Authentication escalated from afterthought to primary driver**
- **Biometrics is an integral part complex digital rights management matrix**
- **Biometrics & DRM Issues**
  - Machine–to-Machine vs Human-to-Machine Interfaces
  - Latent Integration - Critical component of DRM system
  - Data Ownership - *Who owns my biometric data?*
  - Data Protection – Existing regulations sufficient?

Emerging Technology Environment

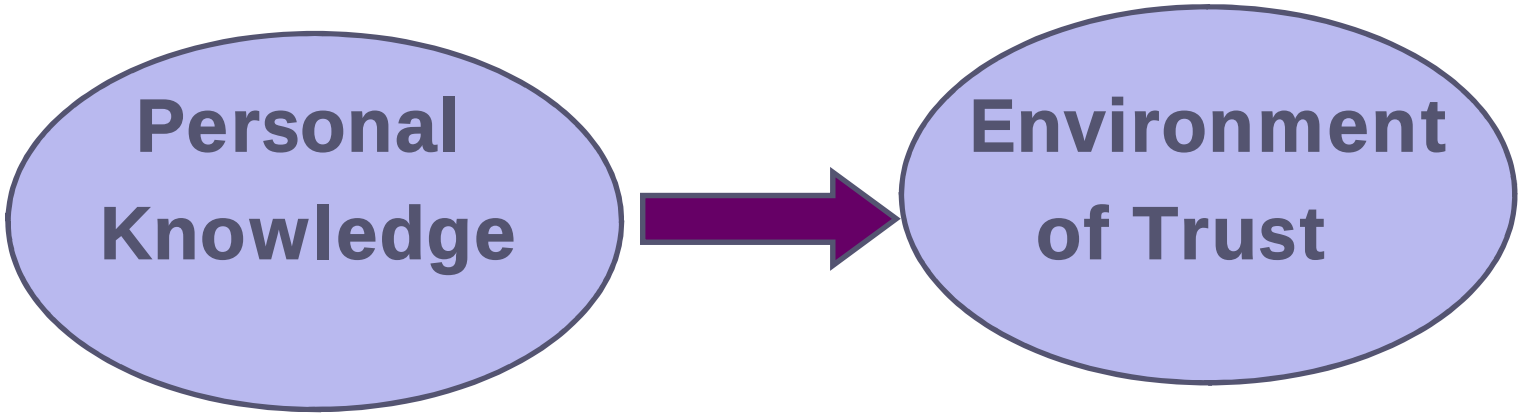
Digital Imaging Convergence

- Mainstream ubiquity as massive convergence takes hold and individual biometric categories disappear
- More than consolidation of the key players or one technology winning out over another
- Actual merging and morphing of the capture devices and the algorithms
- Ultimately, capture devices and algorithms indifferent, regardless of scale, to nature of the type of pattern-data being analyzed
- Over time capture devices become ubiquitous, cheap, reliable commodities compressed into a tiny form factor embedded in virtually everything

Emerging Technology Environment
Distributed Network Computing

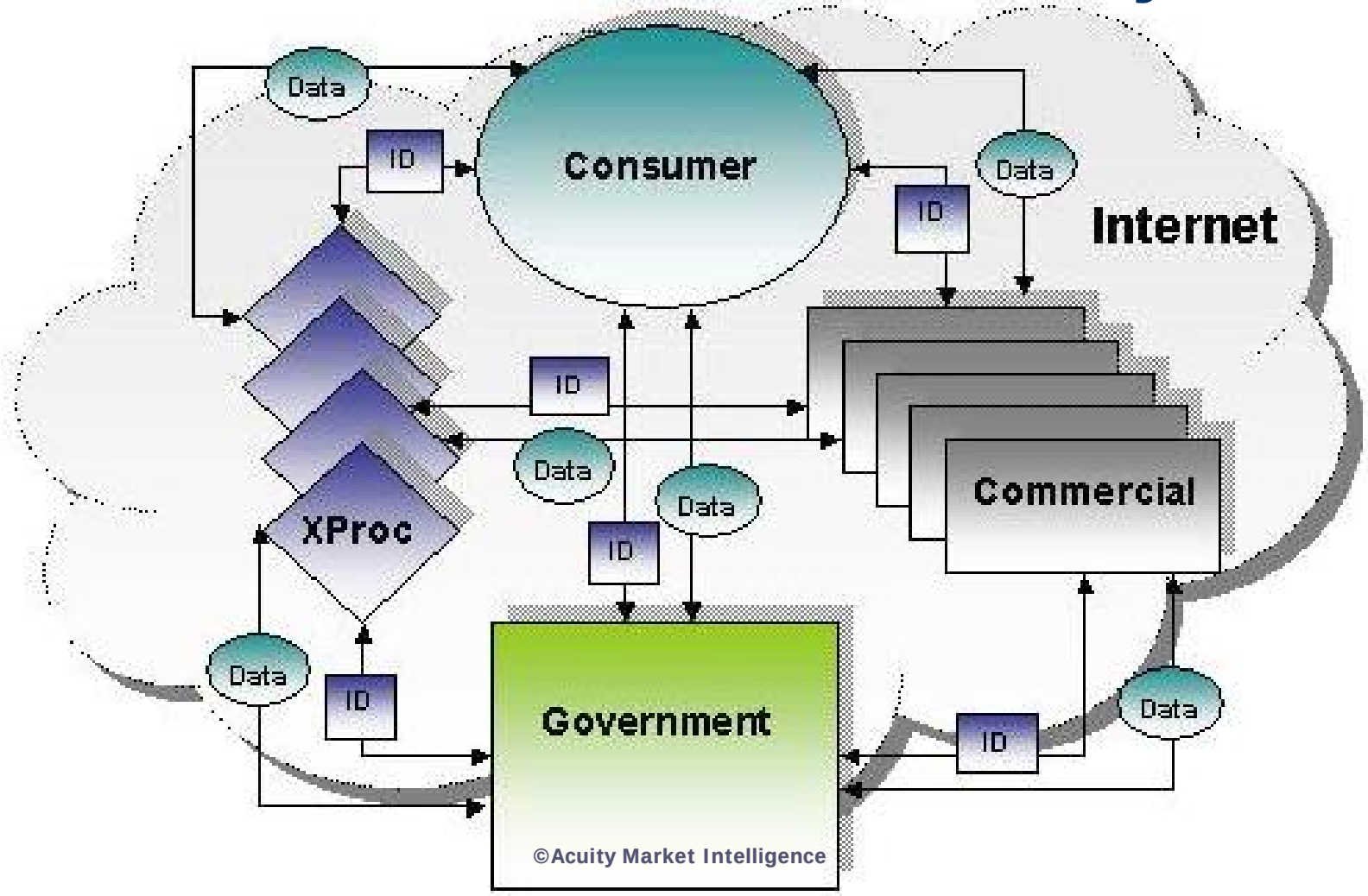
- Identification at the Point of Use
- Network Infrastructure Evolution

  "Halt .. Who goes there?"
- Anonymity versus Privacy
  - Network Based Identity
  - Federated Identity

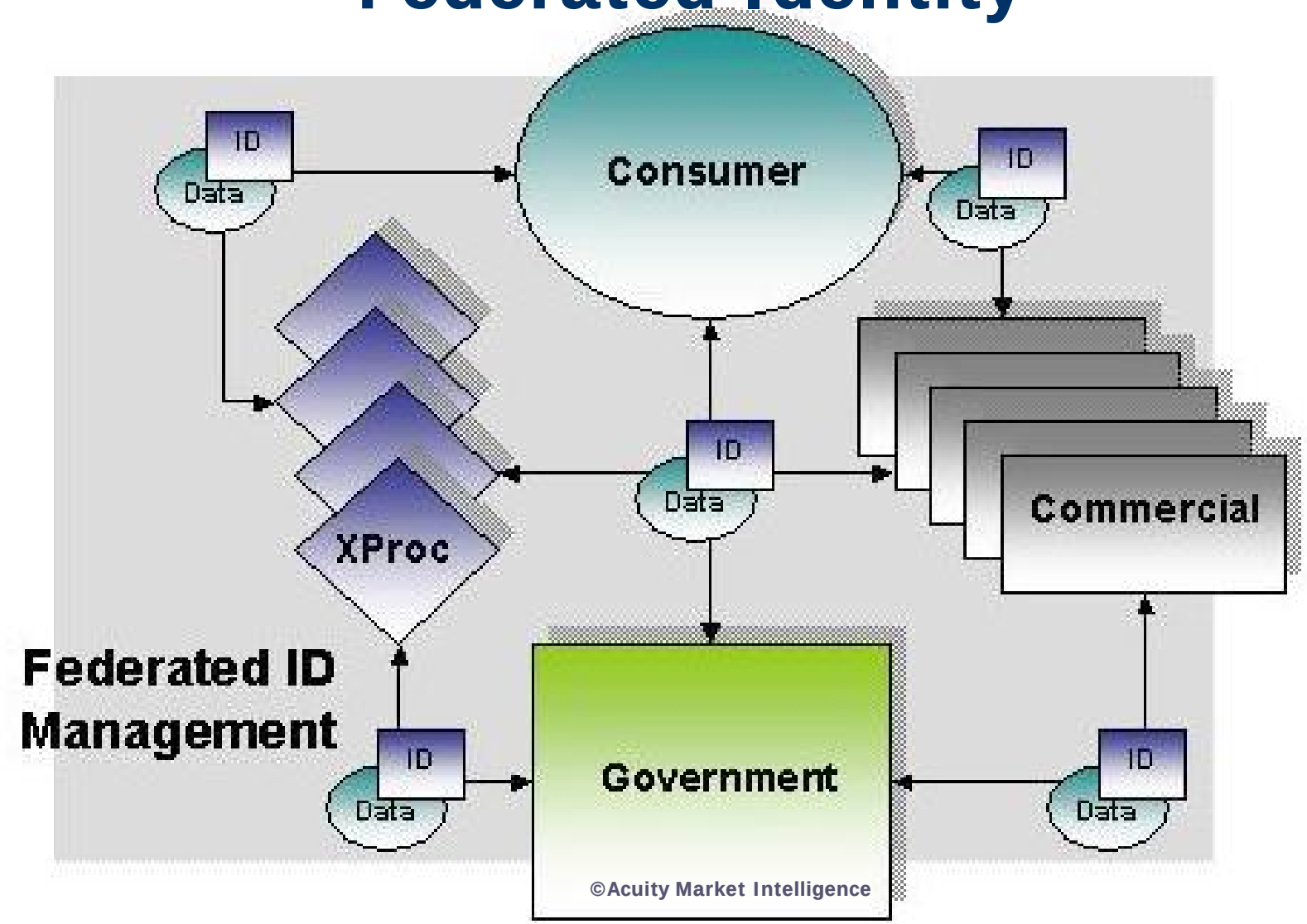


Distributed Network Computing

Network Based Identity

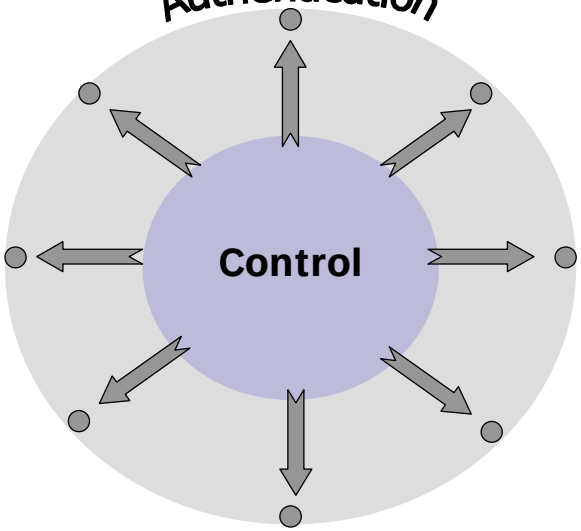


Distributed Network Computing
Federated Identity

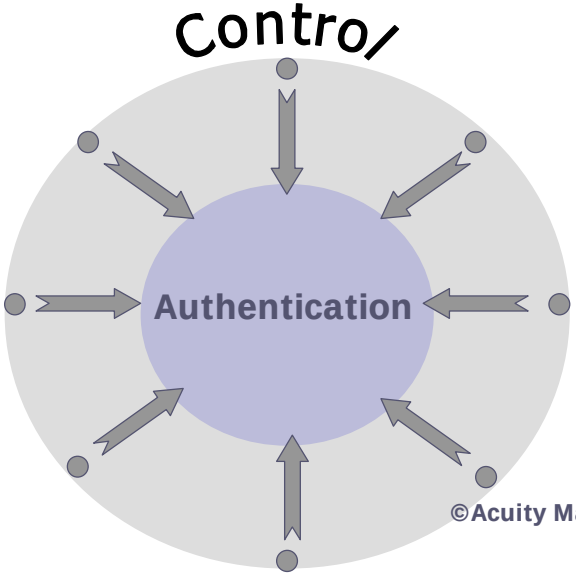


Distributed Network Computing
Authentication Models

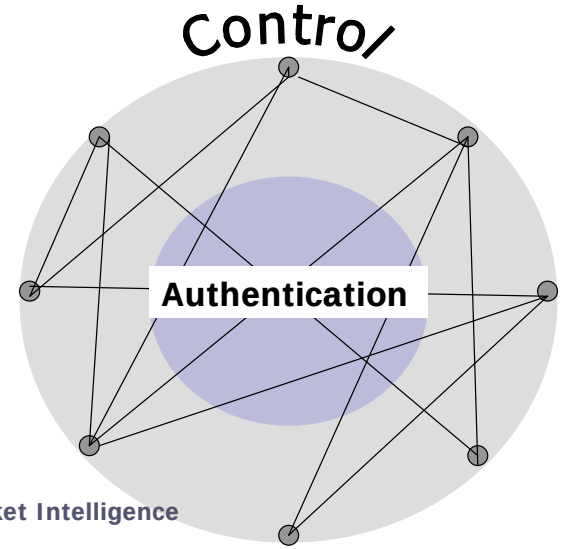
Centralized Control



Centralized Authentication



Virtual Centralized Authentication



ID on Demand
Identity Fixed

No Centralized Storage
ID as Needed
Identity is Not Fixed

Seminar Wrap Up

- **Part I: Market Evolution Context**

  The market is evolving towards fully integrated large scale solutions. The first waves will be Public Sector Border Management and Commercial Enterprise Security

- **Part II: Solutions Development Model**

  To date, market focus has been on core identification technology development and performance. Solutions development implies a shift towards the human/societal factors based on a well developed information infrastructure.

- **Part III: From Technology to Solutions**

  Solutions require technology and performance standards as well as a structured legal and regulatory framework and well defined human factors engineering to appropriately bridge the human-machine identification gap. Progress in this arena will depend on the focused and aggressive efforts of all industry players.

Key Take Aways

- **End Users** – Demand socially acceptable solutions
- **Vendors** –Take responsibility for creating Whole Product Solutions, build alliances along the entire value Chain
- **Targeted Solution Providers** – Educate and facilitate the evolution of your niche
- **System Integrations** – Be proactive market developers – drive & invest in the building blocks of large scale integrated solutions
- **All** - Champion Privacy Enhancing Applications, actively engage in the development of Standards, Human Factors Excellence & Truly Interoperable Systems

More Analysis

Review the Following Articles:

- **Biometrics and Border Control: Beyond US VIST**
  Digital ID World Magazine, Sept/Oct 2004
- **Towards Privacy Enhancing Applications of Biometrics**
  Digital ID World Magazine, June/July 2004
- **Collision Course: Biometrics and Rights Management**
  Digital ID World Magazine, March/April 2004
- **Battle of the Biometrics**
  Digital ID World Magazine, Oct 2003

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