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The Innovations of Civil GPS Applications in the United States

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May 7-8, 2013

Overview

- Objectives of the study
- Recent GPS market developments and innovations
- Timeline of major innovations of civil GPS applications
- Analytical framework to assess the economic & social impacts of GPS
- Research agenda and approaches
- Comments and suggestions

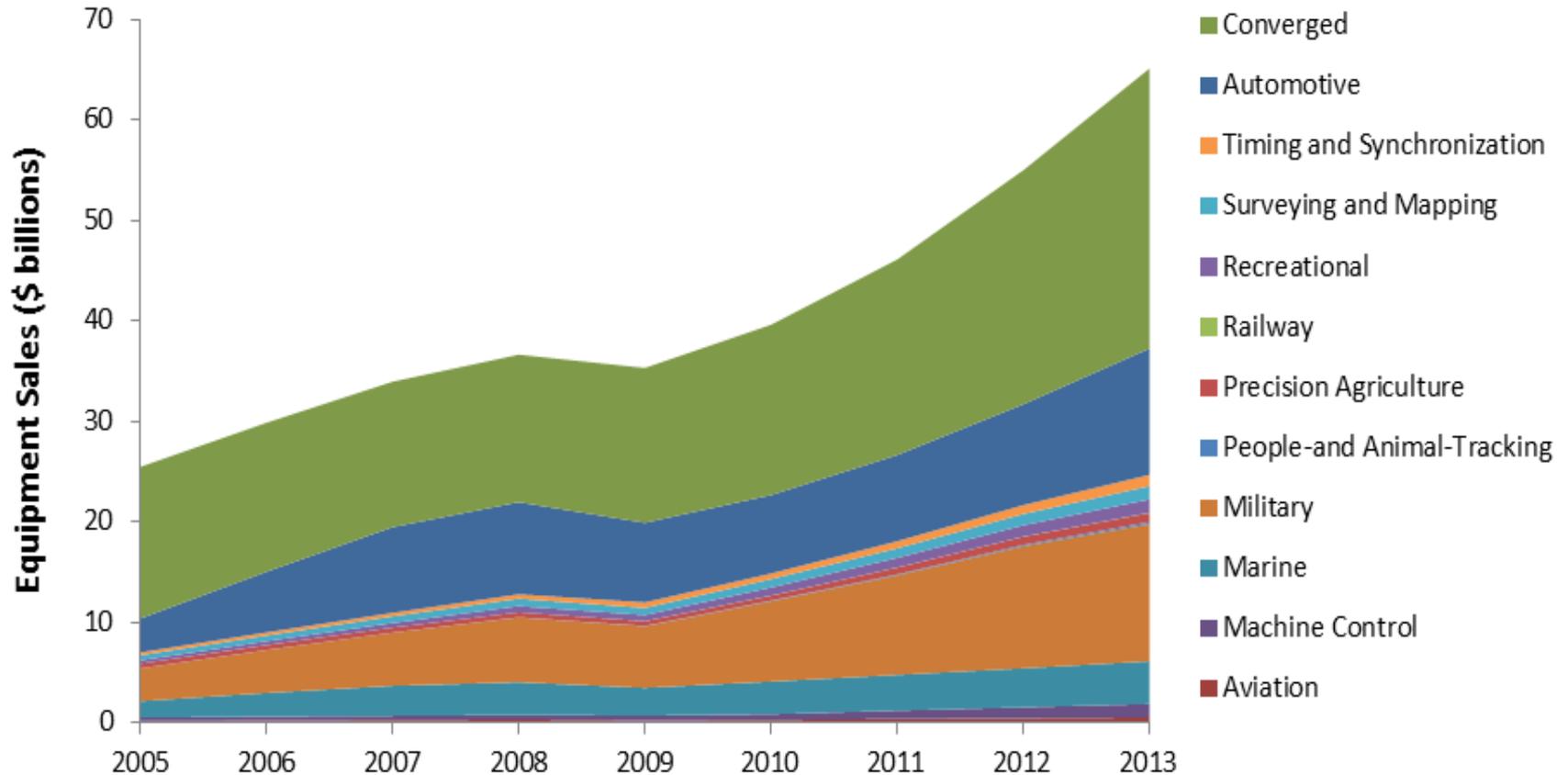
3 objectives of the study

- To identify major innovations and timeline of civil GPS applications
 - Available in the markets
 - To be available in the markets
- To synthesize findings of the economic impacts, business impacts, and cost-and-benefit analyses of GPS
 - Peer-reviewed articles
 - White papers
 - Industry/manufacturers/companies estimates
- To estimate the economic and social benefits of GPS applications on key sectors
 - Commercial sectors
 - Noncommercial sectors

Developments of GPS products

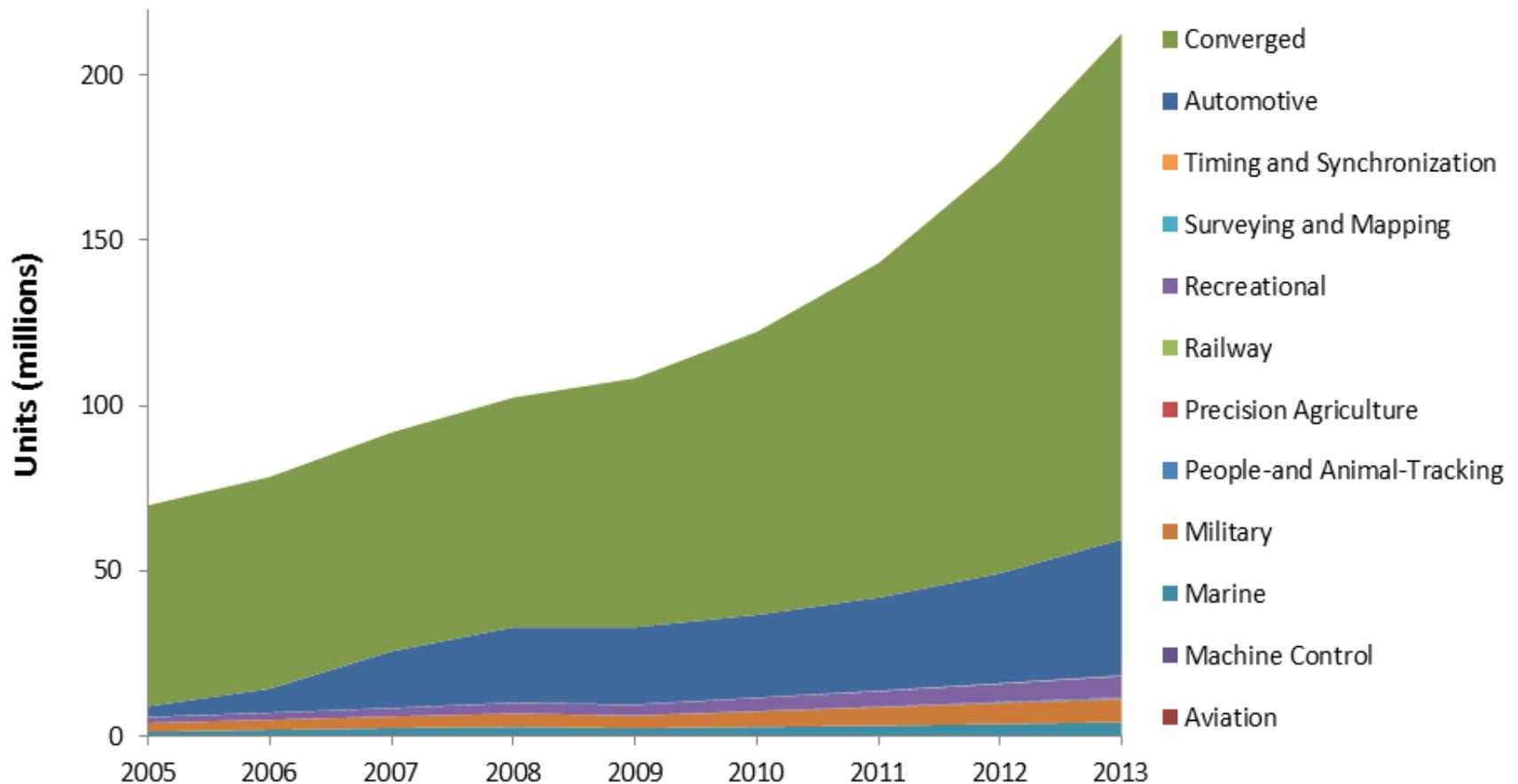
- Shipments and unit sold of GPS equipment
 - Commercial sectors
 - Noncommercial sectors
- Economic impacts of GPS manufacturing sector
 - Direct effects
 - Indirect effects
 - Induced effects
- Economic & social impacts of the applications of GPS across sectors
 - Commercial sectors
 - Noncommercial sectors

\$60+ billion sales of GPS equipment



Source: ABI Research

Units of GPS equipment sold



Source: ABI Research

GPS-related companies are diverse

➤ Direct Economic Impacts

- ❑ Radio & Television Broadcasting, Wireless Communications Equipment (NAICS code 334220)
- ❑ Search, Detection, Navigation, Guidance, Aeronautical & Nautical Systems, Instrument Manufacturing (NAICS code 334511)
- ❑ Other Measuring and Controlling Device Manufacturing (NAICS code 334519)

➤ Indirect and Induced Effects

Job multiplier: 2.3 ~ 3.1 for every job

Wage multiplier: \$1.8 ~ \$2.2 for every dollar paid

Output multiplier: \$1.9 ~ \$2.3 for every dollar in output

Innovations of Civil GPS Applications

- 1983: GPS became available to civilians
- 1980s: First hand-held GPS receiver introduced by Magellan Corporation
- 1990s: Agriculture, Aviation, Safety
 - Agriculture tools
 - Augmentation systems: CORS, GDGPS, NDGPS, WAAS
 - Aviation: blind landing, air traffic control
 - Safety: roadside assistant, disaster recovery (FEMA)
- 2000s: Aviation, Construction, Farming, Mobile Phones
 - Turn off Selective Availability (SA) in 2000
 - Aviation: accurate & real-time landing
 - Construction & farming tools
 - Mobile phones
- 2010s – Present: Aviation, Communications, Public Safety, Traffic Congestion Control, Timing & Synchronization

Economic & social impacts are far reaching

- Commercial Sectors: \$67~\$122 billion a year (ndp|consulting)
 - ❑ Precision agriculture: \$20-\$33 billion a year
 - ❑ Engineering construction: \$9-\$23 billion a year
 - ❑ Commercial surface transportation: \$10-\$15 billion a year
- Geo Services (geographic mapping and location-based services):
 - ❑ \$22 billion a year on time and fuel savings, and another \$12 billion a year on educational impact (Oxera)
 - ❑ 15x-20x the size of the geo industry of \$73 billion in revenues and more than 500,000 people (BCG)
- NextGen: The cumulative benefits are expected to be \$23 billion through 2018 and \$123 billion by 2033 (DOT)
- Household Surveys: GPS can lead to better economics and better policy advice (Gibson & McKenzie)

\$122B annual direct benefits to commercial GPS users

	Annual GPS Equipment Spending (\$ billion)	Estimated Annual Benefits (\$ billion)
Precision agriculture (crop farming)	\$0.5	\$19.9 - \$33.2
Engineering Construction (heavy & civil and surveying/mapping)	\$1.1	\$9.2 - \$23.0
Transportation (commercial surface transportation)	\$3.2	\$10.3 - \$15.1
Sub-total (3 industries examined)	\$4.8	\$39.4 - \$71.3
Other commercial GPS users	\$3.5	\$28.2 - \$51.1
Total commercial GPS users in the U.S.	\$8.3	\$67.6 - \$122.4

Analytical framework to assess economic benefits of GPS

- Literature review
 - Economic impacts
 - Business impacts
 - Cost-and-benefit analyses

- Data and information collection
 - Government officials
 - Commercial databases
 - Industry

- Sector selection focus
 - Commercial
 - Noncommercial

- Assessing the economic impacts of GPS on the U.S. economy
 - GPS manufacturing sectors
 - Applications of GPS technology

Sources of the relevant analyses

Research, assessments, surveys:

- Academic journals and white papers
- Government assessments
- Fee-based industry analyses
- Manufacturers' surveys and business materials

Data, statistics, and forecasts:

- Government statistics
- Commercial data
- Manufacturers' data and surveys

16 Critical Infrastructure Sectors

- Chemical
- Commercial Facilities
- Communications
- Critical Manufacturing
- Dams
- Defense Industrial Base
- Emergency Services
- Energy
- Financial Services
- Food & Agriculture
- Government Facilities
- Healthcare & Public Health
- Information Technology
- Nuclear Reactors, Materials & Waste
- Transportation Systems
- Water & Wastewater Systems

Source: U.S. Department of Homeland Security

Next steps

- Agenda
 - Deliverables
 - Timeline
- Research Approaches
 - Desk research
 - Agencies' assessments
 - Manufacturers' information
 - Users' surveys
- Comments and suggestions

About Us

ndp|consulting is an economic consulting firm in Washington, D.C., that specializes in assessing complex issues in public policies, finance, international trade, and corporate business and marketing strategies.

Founded in 2001, our clients includes U.S. and foreign corporations, financial institutions, law firms, trade associations, and multinational organizations.

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Additional slides

Nearly \$20B benefits to crop farming per year

	Annual Value (\$ billion)	60% Adoption: Annual GPS Benefits (\$ billion)	100% Adoption: Annual GPS Benefits (\$billion)
Crop production	\$169.1	\$10.1	\$16.9
10% yields gain			
Savings from affected Input expenses	\$108.4	\$ 9.8	\$16.3
10% Labor wages			
15% Capital (machine & equip.)			
15% Inputs (seed, fertilizers, pesticides, fuels)			
Total		\$19.9	\$33.2
% of total annual production (\$169.1 billion)		11.8%	19.6%
GPS equipments (2010) :			
Sales (\$ billion)	\$0.5		
Units Sold	38,000		
Unit Price (\$)	\$13,000		

Over \$9B benefits to engineering construction per year

	Annual Value (\$ billion)	40% Adoption: Annual GPS Benefits (\$ billion)	100% Adoption: Annual GPS Benefits (\$ billion)
60% Labor wages	\$32.0	\$7.6	\$19.1
30% Capital (machinery & equipment)	\$10.6	\$1.3	\$ 3.2
32.4% Affected input expenses	\$ 2.0	\$0.3	\$ 0.7
Total		\$9.2	\$23.0
% of total annual production (\$245.7 billion)		3.8%	9.4%
GPS equipments (2010)			
Sales (\$ billion)	\$1.1		
Units Sold	97,000		
Unit Price (\$)	\$11,000		

Over \$10B benefits to land transportation per year

	Annual Value (\$ billion)	67.9% Adoption: Annual GPS Benefits (\$ billion)	100% Adoption: Annual GPS Benefits (\$ billion)
11.3% Labor	\$83.0	\$6.4	\$9.4
13.2% Capital	\$21.7	\$1.9	\$2.9
13.2% Raw Materials	\$21.7	\$1.9	\$2.9
Total	\$126.4	\$10.3	\$15.1
% of total annual related costs (\$126.4 billions)		8.1%	12.0%
GPS equipments (2005-10)			
Sales (\$ billion)	\$3.2		
Units Sold	3,100,000		
Unit Price (\$)	\$1,000		