2015 Embedded Markets Study

Changes in Today’s Design, Development & Processing Environments

April 2015
UBM CANON’S Electronics Engineering Communities
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Purpose and Methodology

• **Purpose:** To profile the findings of the 2015 results of UBM Tech’s annual comprehensive survey of the *embedded systems markets worldwide*. Findings include types of technology used, all aspects of the embedded development process, IoT emergence, tools used, work environment, applications, methods/processes, operating systems used, reasons for using chips and technology, and brands and chips being considered by embedded developers. Many questions in this survey are trended over three to five years.

• **Methodology:** A web-based online survey instrument based on the previous year’s survey was developed and implemented by independent research company Wilson Research Group from January 14, 2015 to March 31, 2015 by email invitation.

• **Sample:** E-mail invitations were sent to subscribers to UBM Tech Embedded Brands with reminder invitations sent later. Each invitation included a link to the survey.

• **Returns:** 1,807 valid respondents for an overall confidence of 95% +/-2.29%. Confidence levels vary by question. As a guide, confidence for questions with:
  - 1807 respondents = 95% +/- 2.29% vs. 95% +/- 2.05% in 2014
  - 1050 respondents = 95% +/- 3.0%
  - 600 respondents = 95% +/- 4.0%
  - 400 respondents = 95% +/- 5.0%
In which region of the world do you reside?

- US & Canada: 39.2%
- Europe: 25.5%
- Asia: 25.8%
- Latin America: 5.7%
- Africa & Near East: 2.3%
- Australia: 1.5%

Up 12% from 2014
Significant affect on all data
In which region of the world do you reside?

- **US: Total**: 36.3%
  - **US: West Coast**: 8.4%
  - **US: MidWest**: 8.1%
  - **US: Northeast**: 4.4%
  - **US: MidAtlant**: 4.4%
  - **US: Southwest**: 4.2%
  - **US: Southeast**: 4.3%
  - **US: Central...**: 2.2%
  - **US: Territories**: 0.2%

- **Europe**: 25.5%
  - **Asia**: 25.8%
    - **Latin America**: 5.7%
    - **Canada**: 2.9%
    - **Australia**: 1.5%
    - **Africa**: 1.4%
    - **Near East**: 0.9%

Other Asian

- **China (9%)**
- **India (8%)**
- **Korea (2%)**
- **Taiwan (2%)**
- **Japan (1%)**
- **Singapore (1%)**
- **Southeast Asia (1%)**
- **Indonesia**
- **Hong Kong**
- **Others**

Up 12% from 2014
Significant affect on all data
How many employees does your company have at all locations?

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>2015</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 100</td>
<td>40%</td>
<td>44%</td>
</tr>
<tr>
<td>100-499</td>
<td>16%</td>
<td>15%</td>
</tr>
<tr>
<td>500-999</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>1,000-4,999</td>
<td>12%</td>
<td>11%</td>
</tr>
<tr>
<td>5,000-9,999</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td>10,000-19,999</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>20,000 or more</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>Don't know</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Average Number of Employees:
- 2015 = 3,644
- 2014 = 3,842
What is your organization's primary business activity?

<table>
<thead>
<tr>
<th>Business Activity</th>
<th>2015 (%)</th>
<th>2014 (%)</th>
<th>2013 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering/science/research</td>
<td>17%</td>
<td>20%</td>
<td>21%</td>
</tr>
<tr>
<td>Manufacturing &amp; process (non-computer)</td>
<td>10%</td>
<td>15%</td>
<td>7%</td>
</tr>
<tr>
<td>Consumer electronics</td>
<td>10%</td>
<td>14%</td>
<td>10%</td>
</tr>
<tr>
<td>Aerospace</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Contract engineering/design services</td>
<td>6%</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Healthcare/pharma/biotech/biomed</td>
<td>6%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Education/training</td>
<td>5%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Computer mfg (hardware, software, periph)</td>
<td>7%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Comm (telecomm, datacomm, cable, internet)</td>
<td>3%</td>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>Applications software development</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Othr computer-related/comm</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Consulting (non comm/computer)</td>
<td>2%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Transportation/logistics</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td>Solutions provider/VAR/ integrator</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Government: federal (incl military)</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>
For what types of applications are your embedded projects developed?

- **Industrial controls**
  - 2015: 34%
  - 2014: 23%
  - 2013: 23%

- **Consumer electronics**
  - 2015: 33%
  - 2014: 24%
  - 2013: 21%

- **Communications/netwk**
  - 2015: 21%
  - 2014: 22%
  - 2013: 21%

- **Internet of Things***
  - 2015: 12%
  - 2014: 19%
  - 2013: 19%

- **Electronic instruments**
  - 2015: 17%
  - 2014: 17%
  - 2013: 17%

- **Automotive**
  - 2015: 17%
  - 2014: 18%
  - 2013: 17%

- **Medical**
  - 2015: 16%
  - 2014: 18%
  - 2013: 17%

- **Aero/Military (Net)**
  - 2015: 15%
  - 2014: 17%
  - 2013: 16%

- **Computers/peripherals**
  - 2015: 11%
  - 2014: 11%
  - 2013: 10%

- **Power generation/utils**
  - 2015: 8%
  - 2014: 8%
  - 2013: 8%

- **Transportation**
  - 2015: 7%
  - 2014: 8%
  - 2013: 8%

- **Security**
  - 2015: 8%
  - 2014: 9%
  - 2013: 8%

- **Video & imaging**
  - 2015: 8%
  - 2014: 8%
  - 2013: 9%

- **M2M**
  - 2015: 6%
  - 2014: 7%
  - 2013: 6%

- **Audio**
  - 2015: 6%
  - 2014: 7%
  - 2013: 6%

- **Govt & municipal**
  - 2015: 6%
  - 2014: 6%
  - 2013: 7%

* Added in 2015
What role do you primarily play in your organization's embedded systems projects

Any engineer (Net) 51% 56%
Firmware engineer 19% 17%
Software engineer/developer 16% 17%
Hardware engineer 9% 13%
System-level engineer 6% 8%
Quality control/test engineer 1% 1%
Any management (Net) 36% 40%
Project management 13% 12%
Software management 7% 10%
Executive management 9% 9%
Hardware management 5% 4%
Systems management 3% 3%
Quality control/test management 1% 1%
Academic (student or educator) 3% 1%
Sales/marketing/marcom 1% 2%
Other 4% 4%

2015 (N = 1146)
2014 (N = 1514)
Job Functions

- Hardware/software integration
- Writing firmware/softwr for embedded systems
- Debugging firmware/software
- Architecture selection/specification
- Firmware/software design or analysis
- Project management
- Debugging hardware
- Device programming
- Firmware/software testing
- Designing hardware for embedded systems
- Prototype testing
- System design
- Hardware/software co-design
- Board layout/design
- Hardware/software co-verification
- Connected device design
- SoC (system-on-chip) design
- Other

Average number of years out of school:
- 2015 = 20.0 Years
- 2014 = 21.8 years
- 2013 = 19.7 years
Current Embedded Design Environment
Current Embedded Project

New to the world; a new project from scratch
- 2015 (N = 1,807) 44%
- 2014 (N = 2,257) 43%
- 2013 (N = 2,091) 44%
- 2012 (N = 1,704) 44%
- 2011 (N = 1,883) 43%

An upgrade or improvement to an earlier or existing project
- 2015 (N = 1,807) 56%
- 2014 (N = 2,257) 57%
- 2013 (N = 2,091) 56%
- 2012 (N = 1,704) 56%
- 2011 (N = 1,883) 57%
What does the upgrade or improvement include?

- New or different software features: 51% (2015) vs. 48% (2014)
- New or different processor: 39% (2015) vs. 38% (2014)
- New or different connectivity capabilities*: 17% (2015) vs. 21% (2014)
- Mandatory changes/discontinued hdwr/sftwr: 17% (2015) vs. 20% (2014)
- New or different peripherals*: 16% (2015) vs. 13% (2014)
- New or different system logic: 15% (2015) vs. 14% (2014)
- New or different operating system: 12% (2015) vs. 10% (2014)
- New or different analog components: 10% (2015) vs. 10% (2014)

* Added in 2014

Base = Those whose current project is an upgrade/improvement
Which of the following capabilities are included in your current embedded project?

<table>
<thead>
<tr>
<th>Capability</th>
<th>2015 (%)</th>
<th>2014 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-time capability</td>
<td>62%</td>
<td>61%</td>
</tr>
<tr>
<td>Digital signal processing</td>
<td>52%</td>
<td>56%</td>
</tr>
<tr>
<td>Networking capability</td>
<td>51%</td>
<td>52%</td>
</tr>
<tr>
<td>Analog signal processing</td>
<td>43%</td>
<td>46%</td>
</tr>
<tr>
<td>Wireless capability</td>
<td>38%</td>
<td>38%</td>
</tr>
<tr>
<td>GUI *</td>
<td>37%</td>
<td></td>
</tr>
<tr>
<td>Project rugged</td>
<td>30%</td>
<td>34%</td>
</tr>
</tbody>
</table>

2015 (N = 1,606)
2014 (N = 2,048)

* Added in 2015
If wireless, what wireless interfaces does your current embedded project include?

- **Wi-Fi**: 61% (2015), 55% (2014)
- **Bluetooth LE/Smart**: 35% (2015), 27% (2014)
- **Zigbee**: 27% (2015), 21% (2014)
- **Cellular**: 20% (2015), 21% (2014)
- **Bluetooth Classic**: 20% (2015), 19% (2014)
- **NFC**: 19% (2015), 18% (2014)
- **900 MHZ**: 17% (2015), 16% (2014)
- **315/433 MHZ**: 10% (2015), 11% (2014)
- **Unlicensed 2.4-GHz band**: 9% (2015), 8% (2014)
- **Wi-Fi Direct**: 8% (2015), 9% (2014)
- **Proprietary**: 8% (2015), 9% (2014)
- **6LoWPAN**: 6% (2015), 7% (2014)
- **AM or FM radio**: 5% (2015), 5% (2014)
- **Infrared**: 4% (2015), 5% (2014)
- **Custom**: 4% (2015), 4% (2014)

Only answers above 3% or above are shown.
How many people are on your embedded project team?

Roughly, **14 engineers per team** has remained stable for the **last three years**.

<table>
<thead>
<tr>
<th>Role</th>
<th>2015 (N = 1,198)</th>
<th>2014 (N = 1,572)</th>
<th>2013 (N = 2,041)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Team Size</td>
<td>14.3</td>
<td>14.0</td>
<td>14.6</td>
</tr>
<tr>
<td>Firmware Engineer</td>
<td>3.3</td>
<td>2.9</td>
<td>2.7</td>
</tr>
<tr>
<td>Non-Firmware Software Engineer</td>
<td>3.2</td>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Hardware Engineer</td>
<td>2.7</td>
<td>3.0</td>
<td>2.9</td>
</tr>
<tr>
<td>QA/Test Engineer</td>
<td>2.4</td>
<td>2.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Systems/Integrator</td>
<td>1.5</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Other Engineer</td>
<td>1.1</td>
<td>1.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>
What is your development team’s ratio of total resources (including time/dollars/manpower) spent on software vs. hardware for your embedded projects?

Note:
In 2015, respondents averaged working on 2.1 projects at the same time.
In 2014, respondents averaged working on 2.0 projects at the same time.
Do you primarily build your own hardware or do you primarily outsource your hardware requirements?

- Primarily build our own hardware components: 64% (2015) vs. 63% (2014)
- Primarily outsource the hardware components (or purchase the components): 36% (2015) vs. 37% (2014)
New in 2015
Did you start your current embedded design with a development board?

2015 (N = 1,222)

- Yes: 49.5%
- No: 50.5%
Thinking now about the last embedded project you completed (no longer in development), how many months did that project take to finish?

- **6 months or less**: 37% (2015), 34% (2014), 33% (2013), 34% (2012), 33% (2011)
- **7 – 12 months**: 35% (2015), 33% (2014), 35% (2013), 35% (2012), 35% (2011)
- **19 – 24 months**: 9% (2015), 10% (2014), 9% (2013), 9% (2012), 9% (2011)
- **25 months or more**: 8% (2015), 7% (2014), 6% (2013), 8% (2012), 7% (2011)

- **Average (2015)**: 12.4 months
- **Average (2014)**: 12.6 months
- **Average (2013)**: 12.4 months
- **Average (2012)**: 12.5 months
- **Average (2011)**: 12.2 months
In 2015, 38% of all projects finished “ahead of” or “on” schedule, and 62% finished “late or cancelled”. In 2014, 41% of all projects finished “ahead of” or “on” schedule, and 59% finished “late or cancelled”. This downward trend in performance is worse than the previous 4 years that averaged 42%-44% “on-ahead of” schedule.
My current embedded project is programmed mostly in:

- **C**: 66% (2015), 62% (2014), 60% (2013), 60% (2012), 65% (2011)
- **C++**: 21% (2015), 20% (2014), 19% (2013), 20% (2012), 22% (2011)
- **Assembly language**: 3% (2015), 4% (2014), 5% (2013), 3% (2012), 2% (2011)
- **C#**: 2% (2015), 2% (2014), 2% (2013), 2% (2012), 2% (2011)
- **MATLAB**: 3% (2015), 1% (2014), 1% (2013), 1% (2012), 1% (2011)
- **LabVIEW**: 1% (2015), 1% (2014), 1% (2013), 1% (2012), 1% (2011)
- **Python**: 2% (2015), 2% (2014), 2% (2013), 2% (2012), 2% (2011)
- **Other**: 1% (2015), 2% (2014), 1% (2013), 1% (2012), 1% (2011)
My next embedded project will likely be programmed mostly in:

- C: 60% (2015), 60% (2014), 35% (2013), 55% (2012), 4% (2011)
- C++: 24% (2015), 22% (2014), 23% (2013), 3% (2012), 4% (2011)
- Assembly language: 3% (2015), 4% (2014), 3% (2013), 3% (2012), 4% (2011)
- UML or other modeling language: 1% (2015), 1% (2014), 2% (2013), 2% (2012), 2% (2011)
- Other: 3% (2015), 4% (2014), 5% (2013), 6% (2012), 4% (2011)
Does your current project reuse code from a previous embedded project?

In 2015, 86% reused code. 
In 2014, 86% reused code. 
In 2013, 86% reused code. 
In 2012, 85% reused code. 
In 2011, 87% reused code.

Note: Multiple choice for “Yes” answers (a respondents can select more than one type of reused code).
Which of the following software/hardware tools do you currently use?

<table>
<thead>
<tr>
<th>Tool</th>
<th>2015 (%)</th>
<th>2014 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debugger</td>
<td>72%</td>
<td></td>
</tr>
<tr>
<td>Oscilloscope</td>
<td>70%</td>
<td></td>
</tr>
<tr>
<td>Compiler/assembler</td>
<td>68%</td>
<td></td>
</tr>
<tr>
<td>IDE</td>
<td></td>
<td>72%</td>
</tr>
<tr>
<td>Software libraries</td>
<td>57%</td>
<td>57%</td>
</tr>
<tr>
<td>JTAG/BDM</td>
<td>42%</td>
<td>40%</td>
</tr>
<tr>
<td>Software drivers</td>
<td>39%</td>
<td>41%</td>
</tr>
<tr>
<td>Logic analyzer</td>
<td>37%</td>
<td>41%</td>
</tr>
<tr>
<td>Linux tools</td>
<td>26%</td>
<td>28%</td>
</tr>
<tr>
<td>Software testing tools</td>
<td>26%</td>
<td>28%</td>
</tr>
<tr>
<td>Configuration management tools</td>
<td>25%</td>
<td>28%</td>
</tr>
<tr>
<td>ICE</td>
<td>21%</td>
<td>27%</td>
</tr>
<tr>
<td>Source code analysis/timing analysis...</td>
<td>21%</td>
<td>23%</td>
</tr>
<tr>
<td>Graphical Design tools</td>
<td>19%</td>
<td>18%</td>
</tr>
<tr>
<td>Starter, evaluation or development kit</td>
<td>18%</td>
<td>22%</td>
</tr>
<tr>
<td>Static analysis tools</td>
<td>17%</td>
<td>23%</td>
</tr>
<tr>
<td>Simulation modeling tools</td>
<td>15%</td>
<td>16%</td>
</tr>
<tr>
<td>Software verification tool</td>
<td>14%</td>
<td>17%</td>
</tr>
<tr>
<td>Device driver tool</td>
<td>11%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Other tools:
- Network debuggers
- Automatic code generation
- UML tools
- FPGA-based prototypes
- Trace
- Application data analysis tools
- Java tools
- Codevelopment tools
- Rapid prototyping tool
- HIL simulation
- Requirement management tools
- Online design tools*
- Automatic protocol test vector generation
- Network simulators/stimulators
- ROM emulator
- Network design
- Virtual prototypes/simulators
- Network management
- MIB/SNMP
- Other

*Online design tools include:
- Virtual prototypes/simulators
- Network management
- MIB/SNMP

2015 (N = 802)  
2014 (N = 1,136)
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THANK YOU.