Kierunek Elektronika i Telekomunikacja,
Studia II stopnia
Specjalność: Systemy wbudowane

Metodyki projektowania i modelowania systemów

Program wykładu

- Przedmiot: „Metodyki projektowania i modelowania systemów”

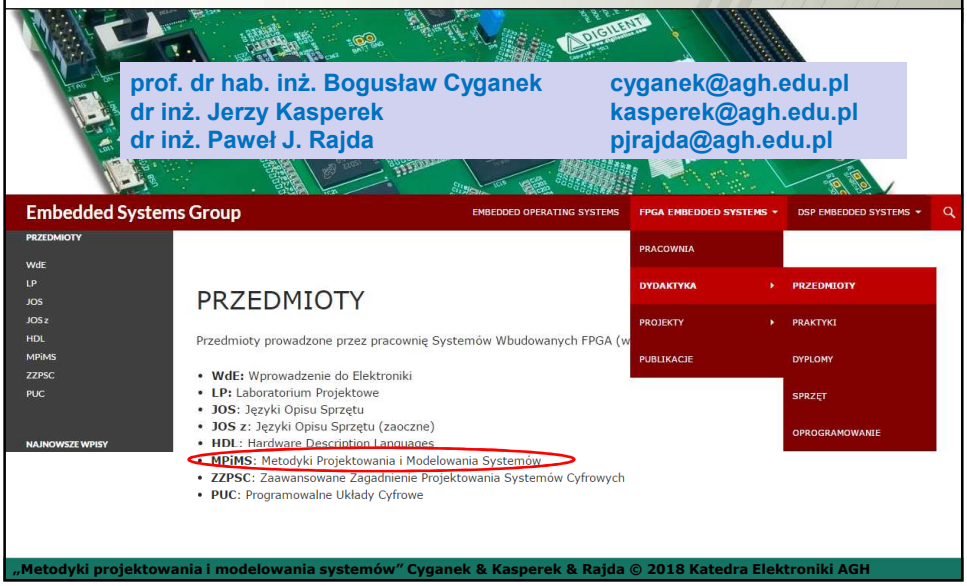
Prowadzący: prof. dr hab. inż. Bogusław Cyganek dr inż. Jerzy Kasperek

– semestr letni i zimowy

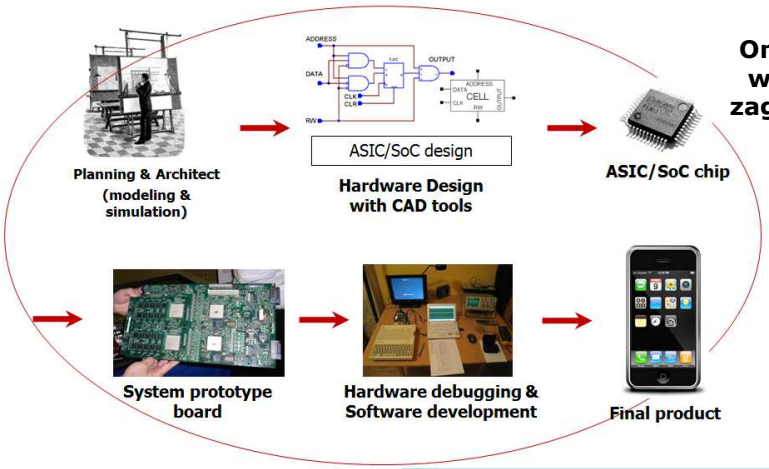
- Organizacja zajęć
  - Wykład, projekt
    - lato - dwie części (BC & JK)
    - zima – jedna część (JK)
  - Wykłady eksperckie
- Warunki zaliczenia przedmiotu:
  - Ocena Projekt
    - projekt „Deklaracja WE” (część JK)
    - projekt programowy (część BC)
    - kolokwia podczas zajęć projektowych (BC)
    - premia za przygotowanie prezentacji ciekawych tematów (BC)
  - Ocena Końcowa

Witryna przedmiotu
http://www.embedded.agh.edu.pl/

prof. dr hab. inż. Bogusław Cyganek cyganek@agh.edu.pl
dr inż. Jerzy Kasperek kasperek@agh.edu.pl
dr inż. Paweł J. Rajda pjrajda@agh.edu.pl

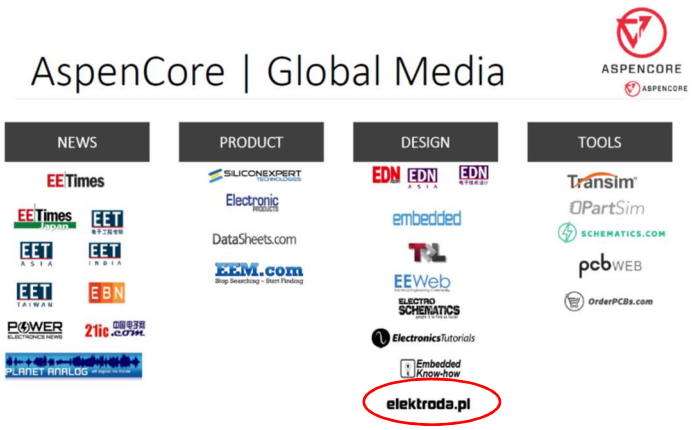


Program przedmiotu na tle cyklu projektowego



Rysunek z wykładu
Prof. Taeweon Suh Computer Science Education Korea University
COMP427 Embedded Systems

Program wykładu na tle raportu ASPENCORE 2017 Market Study
(kontynuacja raportów UBM)



AspenCore is the world's largest media group and creative studio serving the global electronics industry with innovative marketing solutions. Over 200 employees of which include 100 engineers. 50 plus Brands

Program wykładu na tle raportu ASPENCORE 2017 Market Study

ASPENCORE

2017 Embedded Markets Study

Integrating IoT and Advanced Technology Designs, Application Development & Processing Environments

April 2017

Presented By: EETimes embedded

The venerable EETimes/ Embedded.com Embedded Markets Study has been conducted annually for over 20 years, with the sole exception of 2016, when organizational transitions and other events prevented the study from being fielded. Trending the data in this study bridges back to 2015 and the previous three to five years where relevant.Remarkable consistency over the years has monitored both fast and slow moving market changes.

- **Methodology**: A web-based online survey instrument based on the 2015 annual survey was developed and implemented by independent research company Wilson Research Group on February 20, 2017 through to April 15, 2017 by email invitation.
- **Sample:** E-mail invitations were sent to subscribers to EETimesand Embedded.com and related brands with reminder invitations sent later. Each invitation included a link to the survey and an incentive to participate.
- **Returns**: Data is based on 1,234valid respondents for an overallconfidence of 95% +/-2.8%.

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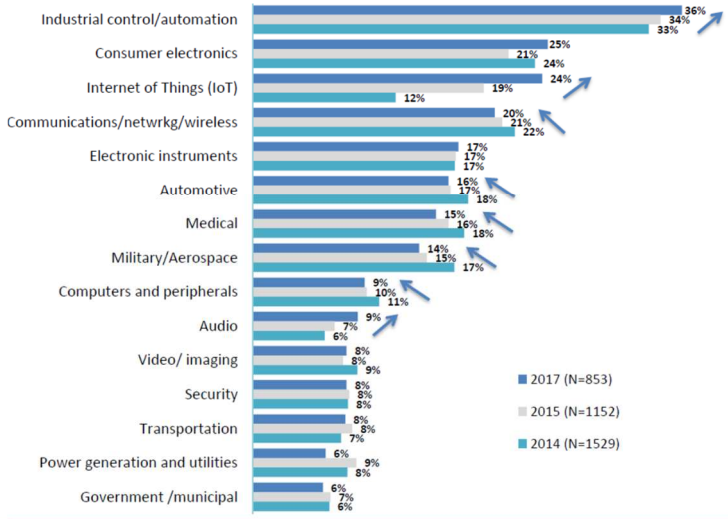
For what types of applications are your embedded projects developed?



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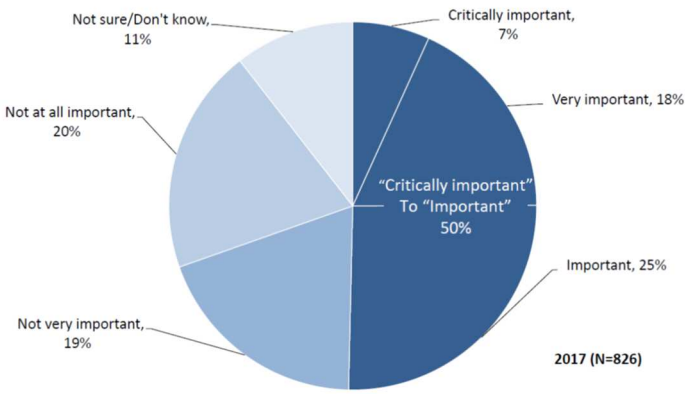
How important will IoT development be to you and your organization in the next 12 months?



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Considering all applications of which you are aware, what do you regard as the most interesting use of the IoT? (Selected write-in responses).

- *Automatic **traffic control**.*
- *Connected automated **houses/buildings.***
- *Connected/autonomous **vehicles.***
- *Detecting location: providing **original content** by screen, audio, phone.*
- *Distributed sensing for diagnostics and control. Think of sensors that **detect bearing. failures in rotating machinery, bridges, roadways, factory lines** etc.*
- *Environment monitoring/ global electrical **energy consumption reduction.***
- *Intelligent industrial machines, **predictive maintenance** of industrial components.*
- ***Medical** information/**diagnostic** integration, medical devices.*
- *Real-time sensing (**road conditions, power grid data, total-plant monitoring**).*
- ***Earthquake/seismic** monitoring signaling building evacuations in time to save lives.*
- ***Drones; remote control** and monitoring.*
- ***Security** within IOT - the technology is totally insecure.*
- *Smart cities, smart factories, **precision agriculture**, pest management in farming.*
- ***Brain waves to control wheelchair** movement. Opportunities endless and scary.*
- *Wireless monitor for **underground** water.*

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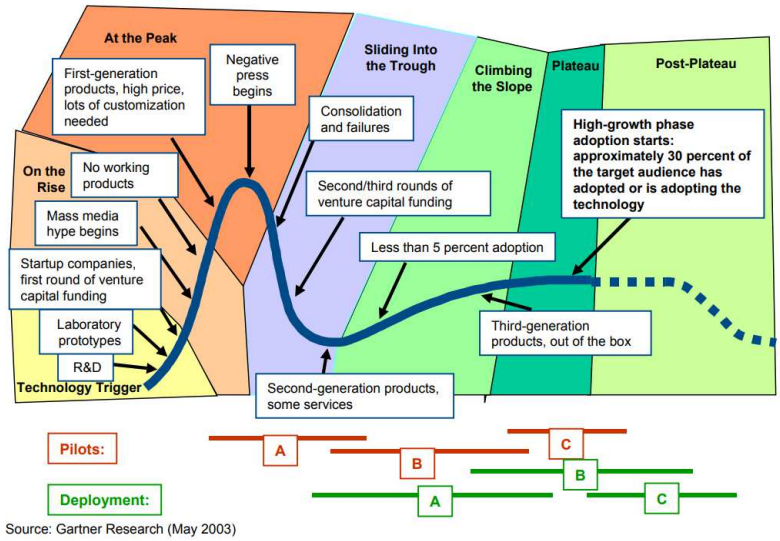
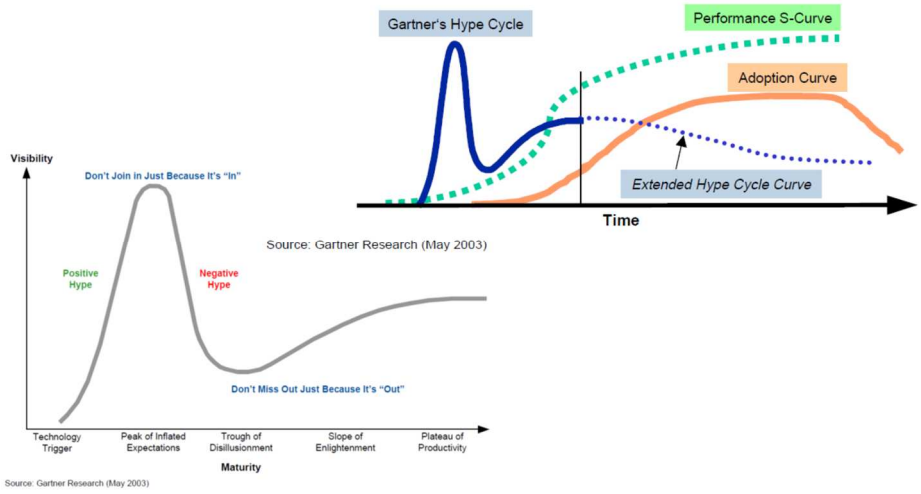
A. Linden, J. Fenn Strategic Analysis Report 30 May 2003
Understanding Gartner's Hype Cycles



Source: Gartner Research (May 2003)

A. Linden, J. Fenn Strategic Analysis Report 30 May 2003
Understanding Gartner's Hype Cycles



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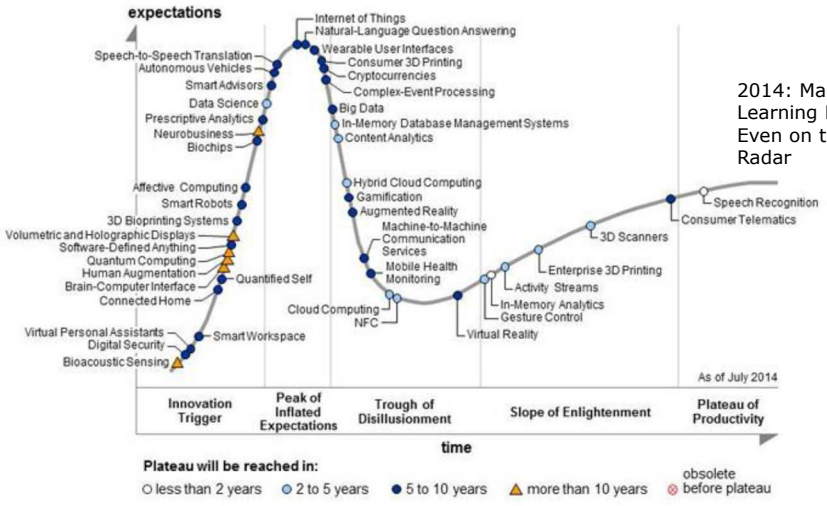

2014: Machine Learning Not Even on the Radar

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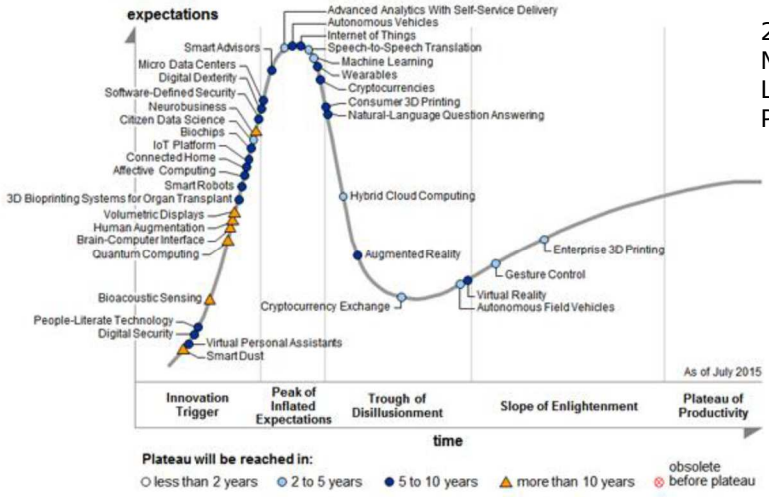

2015: Machine Learning at Peak Hype!

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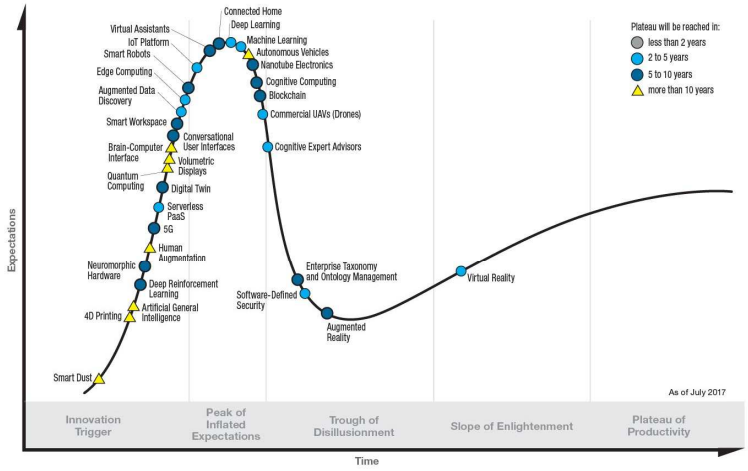
Gartner Hype Cycle for Emerging Technologies, 2017



gartner.com/SmarterWithGartner

Source: Gartner (July 2017)

Gartner

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Are you using any of these advanced technologies in your embedded systems?

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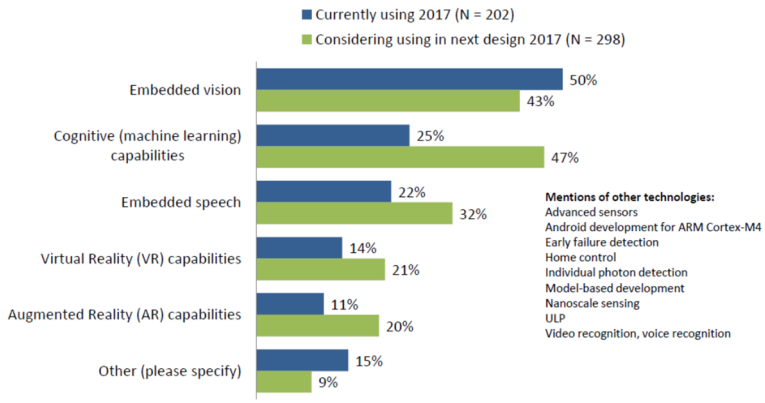

Mentions of other technologies:
Advanced sensors
Android development for ARM Cortex-M4
Early failure detection
Home control
Individual photon detection
Model-based development
Nanoscale sensing
ULP
Video recognition, voice recognition

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Which of the following capabilities are included in your current embedded project?

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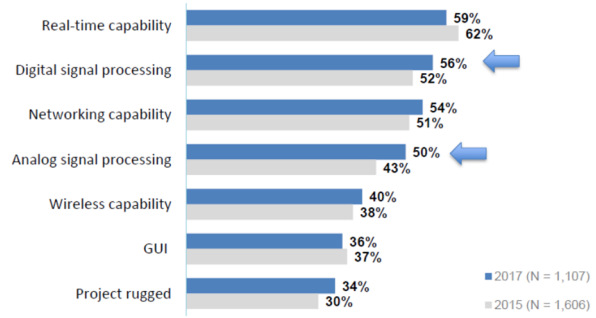

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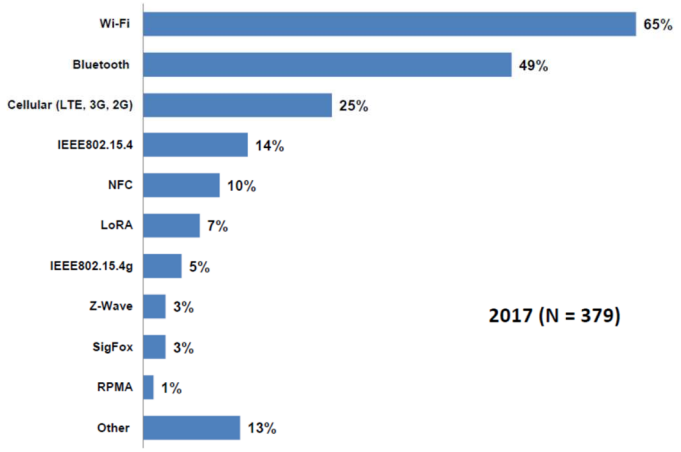
If wireless, what wireless interfaces does your current embedded project include?



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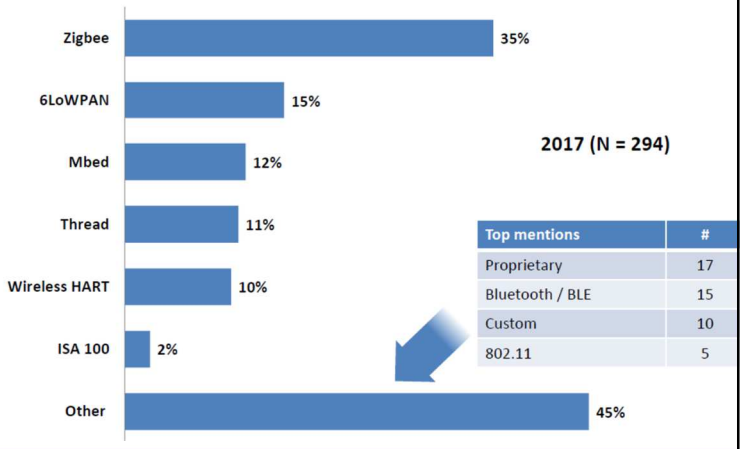
If wireless, what wireless protocols/stacks does your current embedded project include?



Top mentions	#
Proprietary	17
Bluetooth / BLE	15
Custom	10
802.11	5

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How many people are on your embedded project team?

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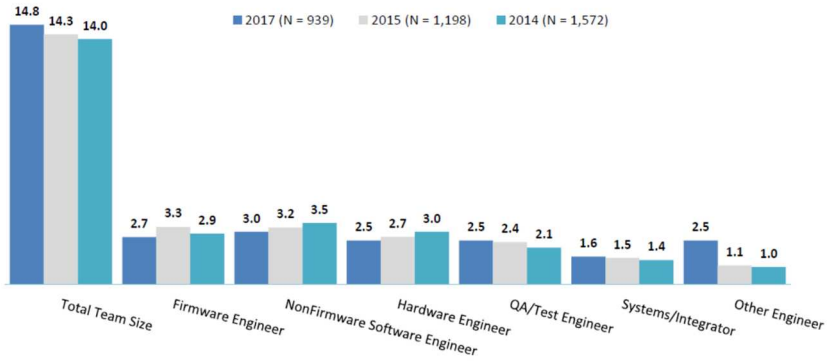
14.8 **engineers per team** is slightly higher than 2015 and 2014.



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What is your development team's ratio of total resources (including time/dollars/manpower) spent on software vs. hardware for your embedded projects?

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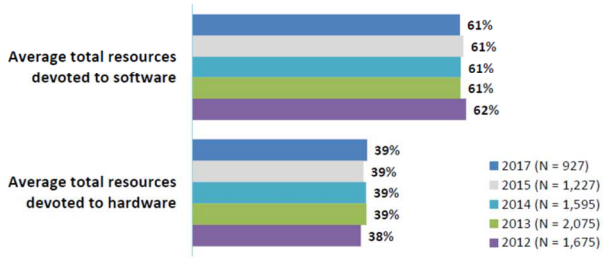

Note:
In 2017, respondents averaged working on 2.1 projects at the same time.
In 2015, respondents averaged working on 2.1 projects at the same time.
In 2014, respondents averaged working on 2.0 projects at the same time.

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Did you start your current embedded design with a development board?

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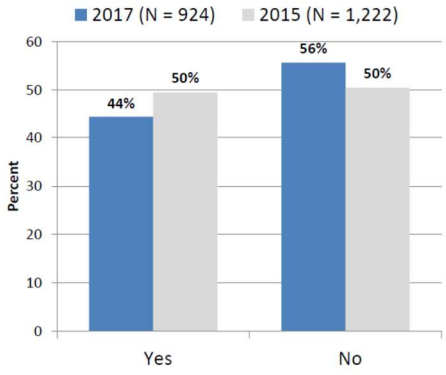

Development Board Started With (Write-in Answers Only)	N=356	Percent
ST Microelectronics	38	10.7%
TI (LaunchPad=5)	38	10.7%
Xilinx	29	8.1%
NXP	26	7.3%
Microchip	21	5.9%
Arduino	20	5.6%
Rasberry Pi	15	4.2%
BeagleBoard Bone Black	12	3.4%
Atmel	10	2.8%
Freescale (NXP)	10	2.8%
Cypress kits	6	1.7%
Renasas	6	1.7%
Altera Stratix V DSP Kit	5	1.4%
Avnet	5	1.4%
Intel Edison	5	1.4%
Silicon Labs	4	1.1%
Digi	3	0.8%
ESP32	3	0.8%
MSP430 - TI	3	0.8%
Nordic/nRF52-DK	3	0.8%

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Thinking now about the last embedded project you completed (no longer in development), how many months did that project take to finish?

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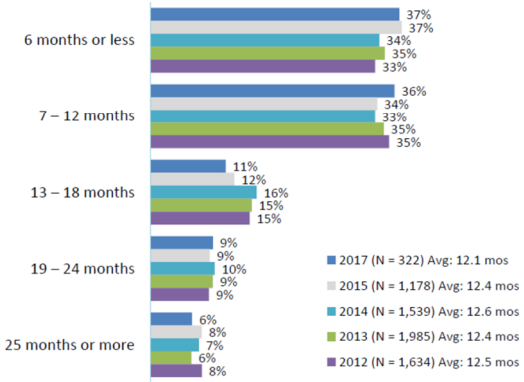

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Was that project completed . . .

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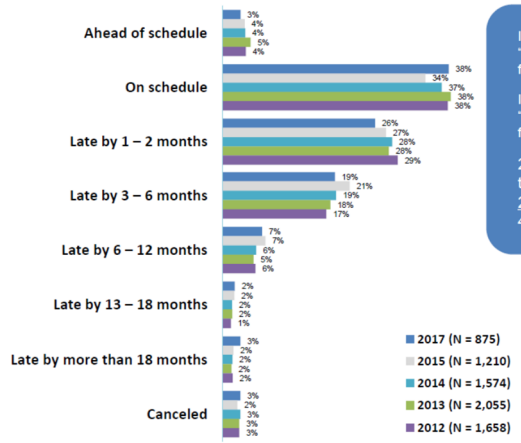

In 2017, 41% of all projects finished "ahead of" or "on" schedule, and 59% finished "late or cancelled".

In 2015, 38% of all projects finished "ahead of" or "on" schedule, and 62% finished "late or cancelled".

2017 performance has returned to the performance levels of the 2012-2014 that averaged 41%-44% "on/ahead of" schedule.

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My current embedded project is programmed mostly in:

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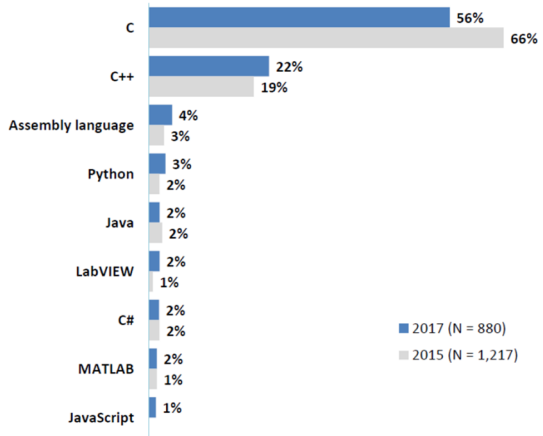

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Does your current project reuse code from a previous embedded project?

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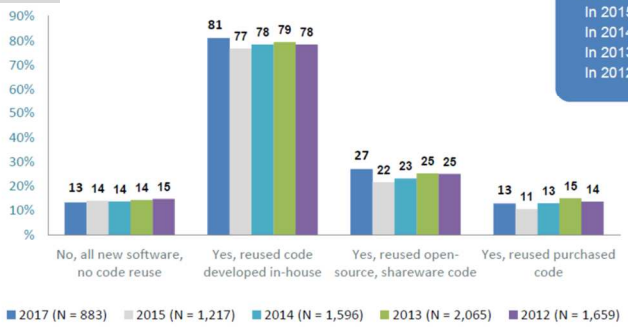
Czyli trzeba kod dokumenować ☺

In 2017, 87% reused code.
In 2015, 86% reused code.
In 2014, 86% reused code.
In 2013, 86% reused code.
In 2012, 85% reused code.



Note 1. Multiple choice for "Yes" answers (a respondents can select more than one type of reused code).
Note 2. 76% of respondents also reused hardware or hardware IP.

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What percentage of your design time is spent on each of the following stages?

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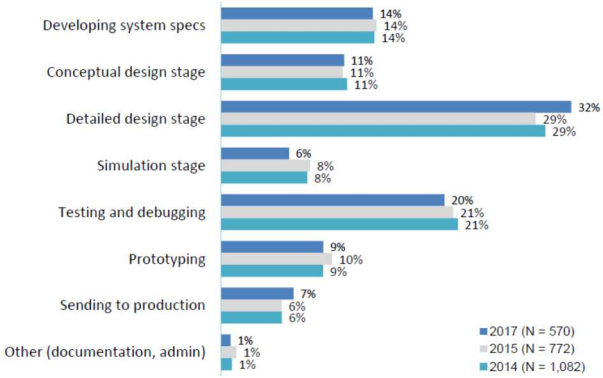

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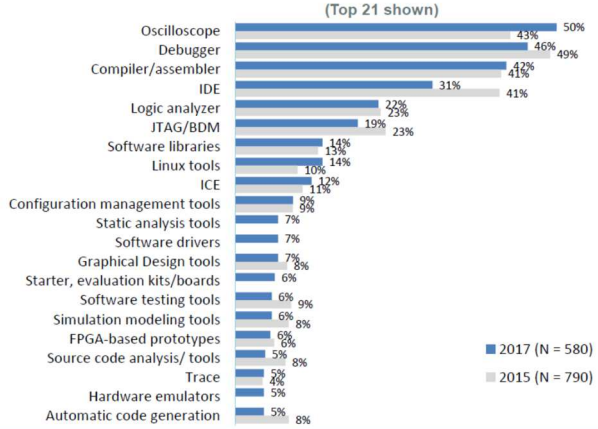
Which of the following are your favorite/most important software/hardware tools?



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What are the most effective ways that you systematically or formally maintain, educate, and advance your professional skills?

Other Related Demographics	2017	2015	2014	2013
Average days per year spent on career training	9.7	9.5	9.2	9.0
Average number of years out of school	24.9	20.0	21.6	19.7
Hours per week spent reading technical publications	4.8	4.6	5.2	4.8
Technical books read in full or in substantial part per year	3.2	3.7	3.9	3.9

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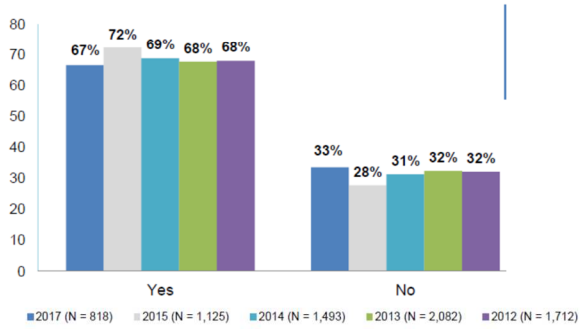
Does your current embedded project use an operating system, RTOS, kernel, software executive, or scheduler of any kind?

86% of those not using RTOSes, said the main reason RTOSes are NOT used is simply that they are not needed.

Fairly consistent usage of RTOS, kernels, execs, schedulers over past 5 years



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What are the most important factors in choosing an operating system?

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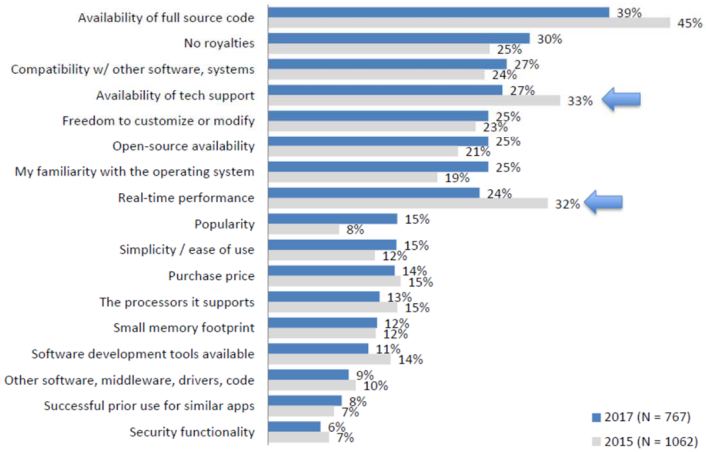

Base: Currently using an operating system

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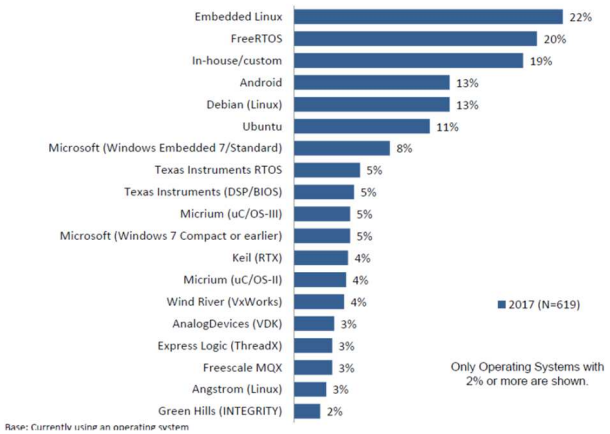
OS/RTOS usage –67% overall usage, down from 2015 (72%).
•**Open Source OS usage –**Now 41%, up from 31% in 2012 and continuing up.
•**Commercial OS usage –**Now 30%, down from 40% in 2012.
•**Used same OS –**60% used the same OS, down one tick from 2015 of 61%. Happy with it, compatibility, familiarity, same tools are main reasons for using.
•**Reason for Switching –** Hardware/processor changed, chosen for me, new one had better features.
•**Reason for choosing OS –**Full source code (39%), no royalties (30%), compatibility (27%) and tech support (27%).
•**OS/RTOS used –**Embedded Linux (22%), FreeRTOS(20%), Inhouse(19%),
•**OS/RTOS considering –** FreeRTOS(28%), Embedded Linux (27%) and Inhouse(29%) were top three RTOSesbeing considered.

Please select ALL of the operating systems you are currently using.



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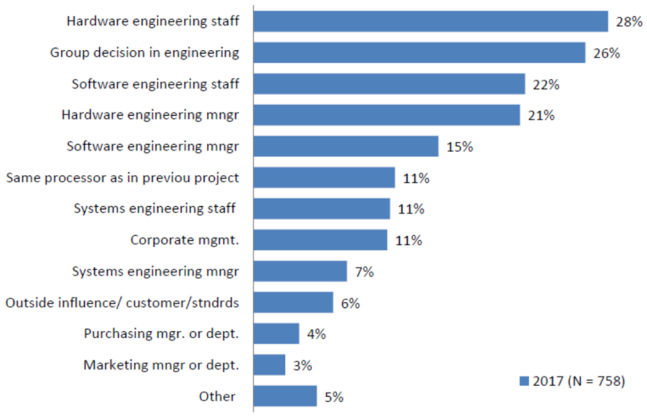
Who were the greatest influences on the choice of the processor for your current project?



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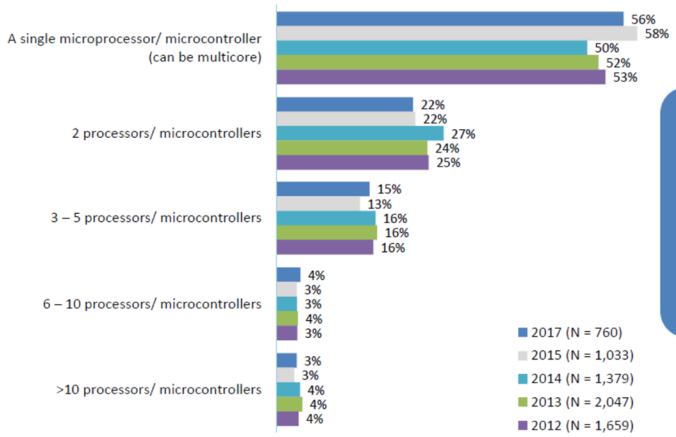
My current embedded project contains:



The average number microprocessor/micro controllers per project was:

2.3 in 2017
2.1 in 2015
2.4 in 2014
2.4 in 2013
2.3 in 2012

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My current embedded project's main processor is a:

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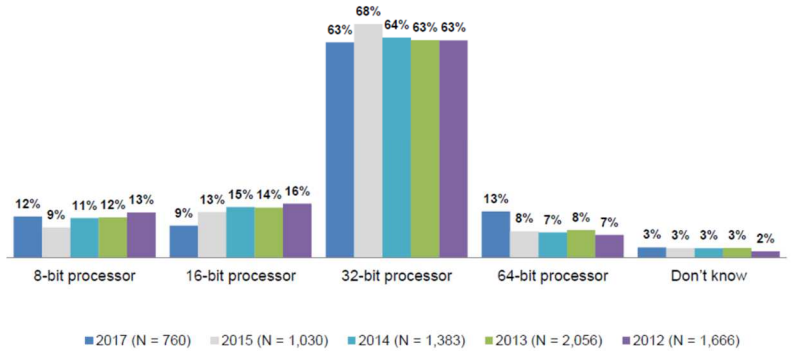

Note. 52% of respondents said additional processors (if any) were 32-bit processors, 18% said they added 8-bit processors, 14% added 16-bit processors, and 11% added 64-bit processors to their current embedded project.

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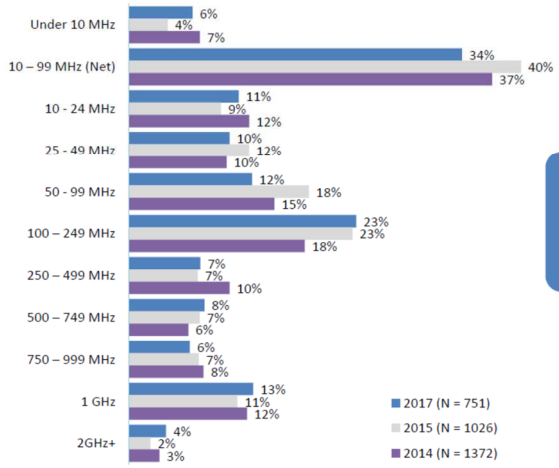
My current embedded project's main processor clock rate is:



The average processor clock rate was:
445 MHz in 2017
397 MHz in 2015
428 MHz in 2014
485 MHz in 2013

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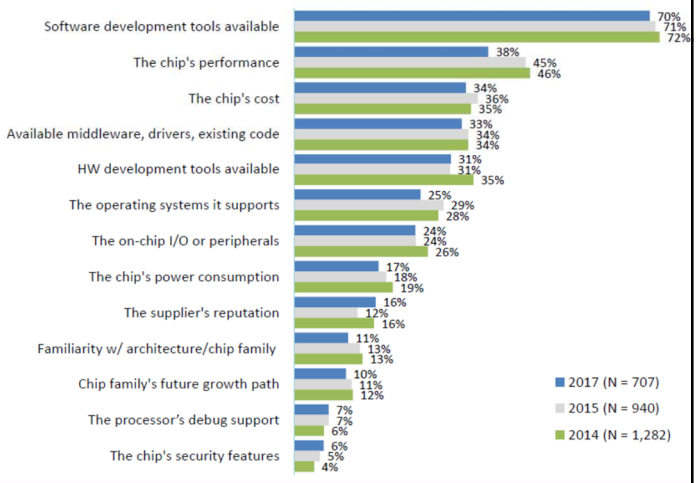
What are the most important factors in choosing a processor?



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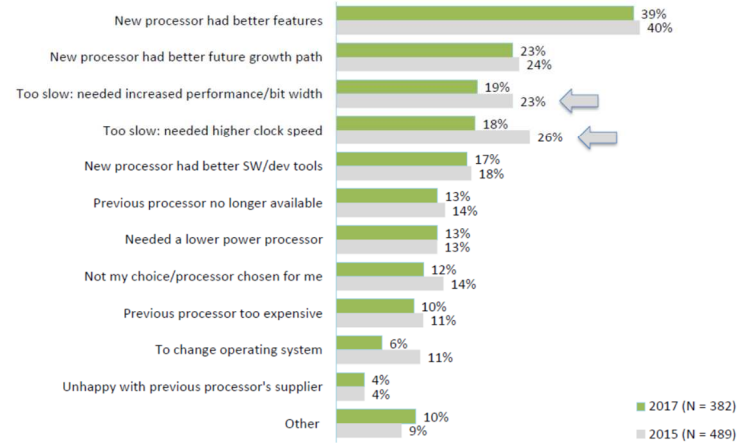
2017 Embedded Markets Study

What were your reasons for switching processors?



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EETimes embedded

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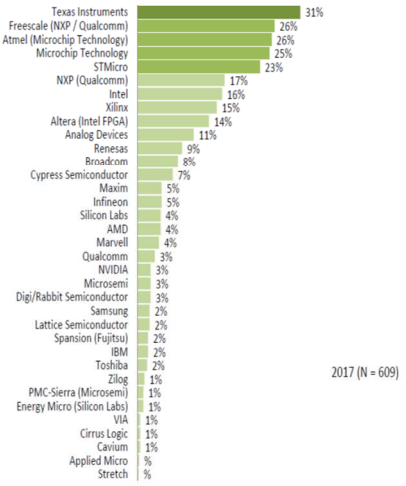
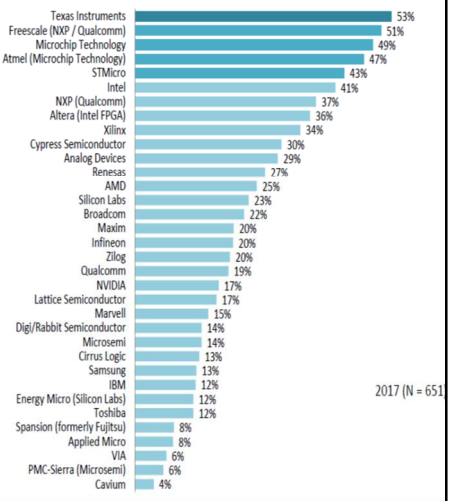
2017 Embedded Markets Study

Please select the processor vendors you are currently using.



Please select the processor vendors you are familiar with.



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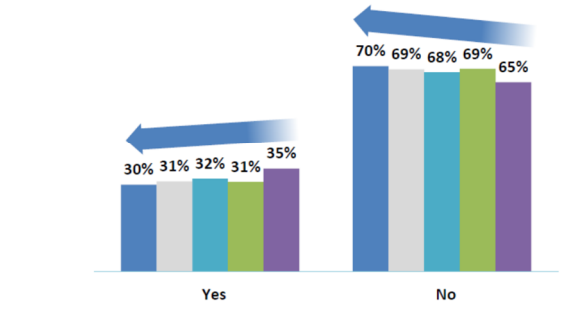
Does your current embedded project incorporate an FPGA chip?



Note 1: Among those not using FPGAs, only **12%** said the trend towards FPGAs with built in multicore processors would change their mind, and 51% said "maybe" it would. And 37% said it would not change their mind.

Note 2: Only **25%** of all respondents said they would use an FPGA in their **next** project further supporting the downward trend in using FPGAs. Those not using FPGAs in the future say they don't need the functionality, the cost of FPGAs is too high, or they consume too much power.

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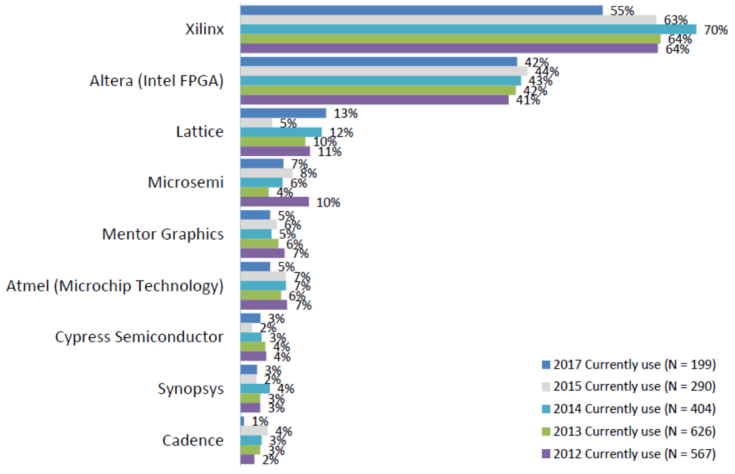
Which of the following vendors does your current embedded projects use for FPGAs?



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Which of the following design techniques will become more important to your designs in the future?

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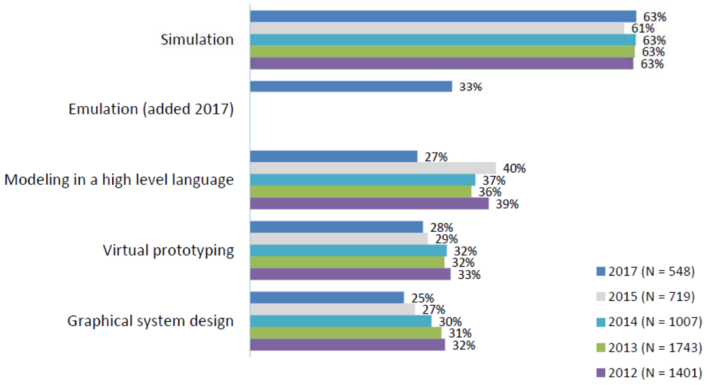

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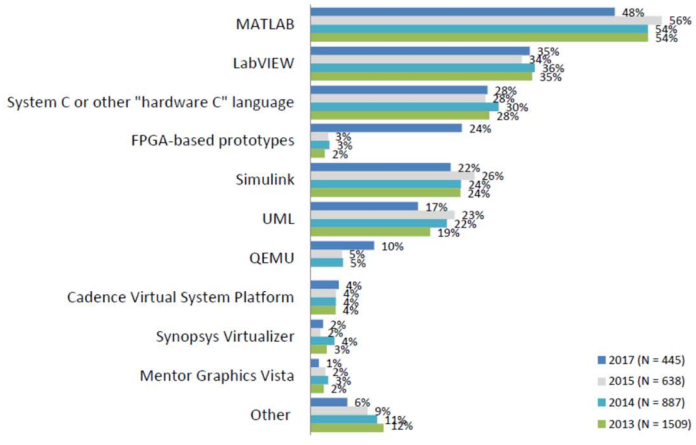
What system level design tools do you or your organization currently use?

ASPENCORE



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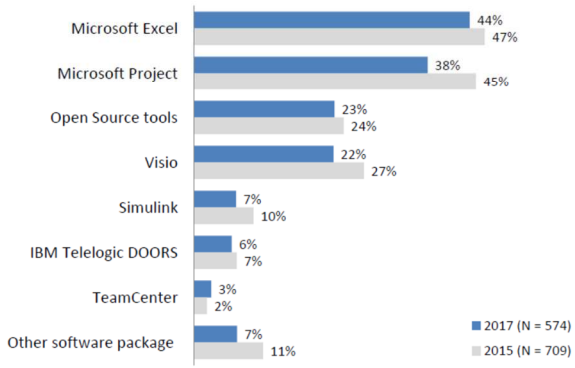
Which of the following project management software packages do you currently use?



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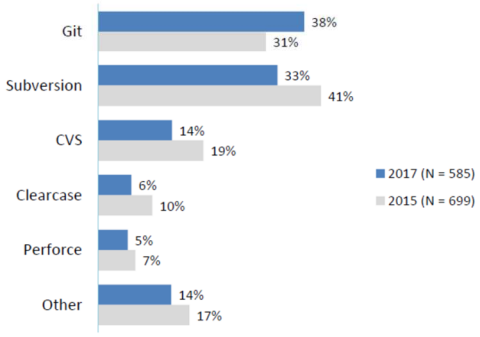
ASPENCORE

Which of the following Version Control software systems do you currently use?



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Does your current design use a graphical user interface?

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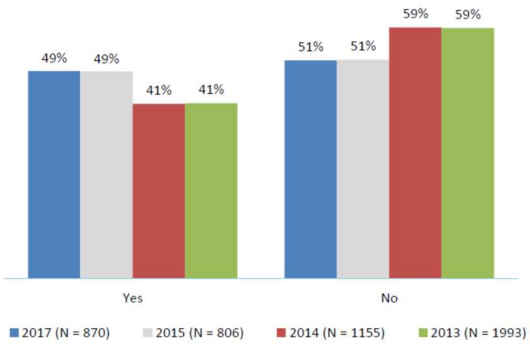

AGH

Syllabus wykładów – MPiMS I (JK)

Wprowadzenie do systemów wbudowanych
- Analiza wymogów
- Otoczenie prawne projektu
- Założenia projektowe
- Zagadnienia bezpieczeństwa funkcjonalnego/ Klasyfikacje SIL

Dokumentacja projektowa i produkcyjna systemów zgodnie z IEC61508
- Analiza specyfikacji projektowej
- Dokumentacja przedprojektowa
- Dokumentacja ścieżki sprzętowej (edytor schematów, vault, zarządzanie listą komponentów)
- Dokumentacja ścieżki programowej
- Dokumentacja produkcyjna i serwisowa

Syllabus wykładów – MPiMS I (BC)

Projektowanie systemów – oprogramowanie

- Metodyka projektowania oprogramowania: modele projektowe (wodospadowy, spiralny), budowa bibliotek, narzędzia CAD; Zarządzanie projektem: SCRUM*, test-driven* development, planowanie zadań, zarządzanie grupą projektową; Programowanie przez kontrakt; Zarządzanie jakością oprogramowania; *Code refactoring*; *Code profiling* oraz akceleracja;
- Wstęp do projektowania obiektowego: etapy projektowe (*requirements, functionality, analysis, design, implementation, testing, maintenance*); Unified Modeling Language (UML): diagramy przypadków użycia, aktywności, stanów, sekwencji, klas, rozlokowania, komponentów;
- Filozofia projektowania obiektowego; Dostępne platformy i języki programowania obiektowego, metody wyboru; Przegląd konstrukcji programowania obiektowego w C++: klasy, dziedziczenie, szablony, STL; Programowanie komponentowe: co to jest komponent, metodologia projektowania komponentów; Narzędzia prowadzenia projektu: platformy (Win - Visual .NET, Linux - Eclipse), planowanie (Microsoft Project), utrzymania źródeł (SourceSafe, CVS);
- Standardy bezpiecznego kodowania C/C++ na przykładzie MISRA C / IEC 61508.
- Przegląd typowych bibliotek oferowanych przez dostawców segmentu mikrokontrolerów
- Systemy operacyjne w systemach wbudowanych

Syllabus wykładów – MPiMS II

Zagadnienia niezawodności

- Parametry niezawodności komponentów i modułów; Analityczne metody obliczania parametrów niezawodności systemów elektronicznych; Systemy zarządzania niezawodnością (DQM),

Zagadnienia certyfikacji i dopuszczenia produktu do eksploatacji i ochrona prawno-autorska

- Procedury dopuszczenia do eksploatacji; Badania środowiskowe (badania zakresu dopuszczalnych temperatur i wilgotności, badania odporności na wstrząsy i wibracje, badania odporności ESD, badania odporności na zakłócenia *surge / burst*); Badania EMC; Patenty; Znaki towarowe; Zakres ochrony dokumentacji technicznej; Analizy „*Freedom to Operate*"

Syllabus wykładów – MPiMS II

Projektowanie systemów – sprzęt

- Moduły funkcjonalne; Architektury systemów; Analiza dokumentacji producenta;
- Systemy zasilania; Zagadnienia obniżania poboru mocy; Moduły wejścia/wyjścia (klawiatury, moduły wyświetlaczy, inne czujniki i urządzenia peryferyjne);
- Typowe interfejsy - obsługa sprzętowa i programowa (stos TCP/IP, system plików, USB, Ethernet, moduły komunikacji bezprzewodowej);
- Okablowanie i złącza;
- Mechanika i obwody drukowane; Obudowy (stopnie ochrony IP);

Projektowania systemów – przygotowanie prototypów i produkcji seryjnej

- Projektowanie uwzględniające systemowe podejście do weryfikacji i testowania systemów - przykłady rozwiązań. Typowe błędy prototypowania; Systemowe podejście do produkcji seryjnej; Systemy automatycznego testowania produktów. Obsługa systemów podczas eksploatacji.

Dziękujemy...

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