



Sascha Stoeter, J. Hudepohl, F. X. Ekdahl, B. P. Robinson — 2013-05-02

Software Dev. Improvement Program

Enabling software excellence at a hardware company

A Hardware Company

A global leader in power and automation technologies

Leading market positions in main businesses








- 145,000 employees in about 100 countries
- \$39 billion in revenue (2012)
- Formed in 1988 merger of Swiss and Swedish engineering companies
- Predecessors founded in 1883 and 1891
- Publicly owned company with head office in Switzerland



How ABB is organized

Five global divisions

				
Power Products	Power Systems	Discrete Automation and Motion	Low Voltage Products	Process Automation
\$10.7 billion 36,000 employees	\$7.9 billion 20,000 employees	\$9.4 billion 29,000 employees	\$6.6 billion 31,000 employees	\$8.2 billion 28,000 employees

(2012 revenues)

▪ ABB's portfolio covers:

- Electricals, automation, controls and instrumentation for power generation and industrial processes
- Power transmission
- Distribution solutions
- Low-voltage products
- Motors and drives
- Intelligent building systems
- Robots and robot systems
- Services to improve customers productivity and reliability

Shaping the world we know today through innovation

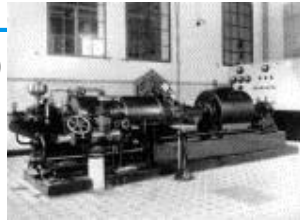
Pioneering technology since 1883

Founding fathers



1900

Steam turbine



1920

Turbochargers



1930

Gas turbine



1940

Electrical drive system for locomotives



1950

Industrial robot



1980

Variable-speed motor drives



Gas-insulated switchgear



1970

Gearless motor drives



1960

HVDC



Electric propulsion systems



1990

2000

Extended control systems



Ultrahigh voltage



ABB technology

Software ascendance

“Can ABB become recognized as a software company?”

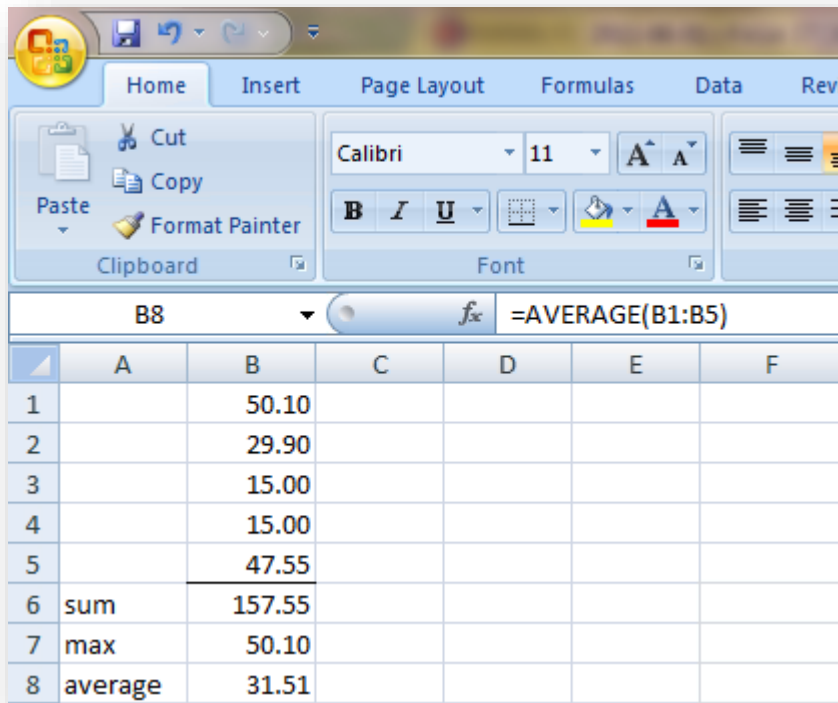


- 1891: BBC starts selling boxes
- 1980s: first DCS
- 2000s
 - Industrial IT, 800xA, SKYVA (till 2003)
 - Network Manager
 - CPM
- 2010s
 - Ventyx, Mincom
 - 2500 software developers
- 2013: software community of 10'000 people

Computer science expertise is essential for ABB

(service, security, integrating acquisitions, ...)

Complexity: Excel vs. ABB controller



A screenshot of the Microsoft Excel application window. The ribbon shows 'Home', 'Insert', 'Page Layout', 'Formulas', 'Data', and 'Review'. The 'Formulas' tab is active, showing the formula bar with `=AVERAGE(B1:B5)` in cell B8. The spreadsheet contains a table with 8 rows and 6 columns (A-F). Rows 1-5 contain numerical data in column B. Row 6 contains 'sum' in column A and '157.55' in column B. Row 7 contains 'max' in column A and '50.10' in column B. Row 8 contains 'average' in column A and '31.51' in column B.

	A	B	C	D	E	F
1		50.10				
2		29.90				
3		15.00				
4		15.00				
5		47.55				
6	sum	157.55				
7	max	50.10				
8	average	31.51				

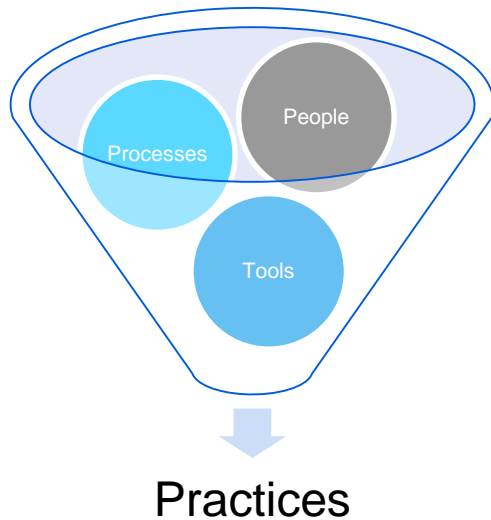
30–50 MLOC



SDIP

Software Development Improvement Program

Transforming Software Development in ABB



- SDIP was launched in 2008 as an ABB Group initiative and chartered to **transform the way ABB develops software**
- For the benefit of ABB's overall business objectives, SDIP aims to bring our software R&D above and beyond industry average to achieve speed, quality and predictability in ABB's software product development.
- 3 people at ABB Group
- Some more in divisions, Corporate Research and IS

Communication and Sharing

Communications and Sharing Productive Bits

- New SDIP Blog created & Productive Bits Newsletter published bi-weekly
- More than two dozen locations have people printing it out and hanging it up in prominent locations in break rooms, common areas, etc.

Productive Bits Newsletter - Episode 1 - Drop It Cause It's Hot!

20. May 2012 20:21 - Brian P Robinson

Introducing the new SDIP Productive Bits Newsletter, where software professionals inside ABB can share tips and tricks they use when developing software. These tips may involve productivity, quality, or any other topic of interest to the larger ABB development community. A new episode will be published every other week on this blog.

The first episode of the Productive Bits Newsletter is written by David Shepherd, a Principal Scientist in the ISS Program at USCRG.

Introduction:

When a software project begins developers usually have one goal: make software that works. As the project moves forward their code soon begins working... and working and working and working. This brings them to their next goal: make software that works fast. However, at this point it's often difficult to determine which code segments are causing delays. Fortunately, developers can use Visual Studio's built in profiling tools to discover hot paths in their program. Once identified it's often possible for developers to alter, avoid, or even drop the offending hot paths.

Here is the newsletter:



Drop It Cause Its Hot - final.pdf

Tag: Profiling Performance
http://inside.abb.com/softwareengineering

SDIP's Productive Bits
Power tips for better software development

today's episode: **Drop It Cause It's Hot** written by: David Shepherd, USCRG

Meet Bob!

Bob loves his job as a software developer at ABB. However, because Bob has a wonderful family he works extra hard from 8-5 so he can leave right on time. Lately Bob's been leaving later and later... mainly because his application takes so long to run (and tests). He wants to fix it, but doesn't know where to start...

What's Hot?

Fortunately, Bob can use Visual Studio's built in profiling tools to discover **hot paths** which are call chains of expensive methods in his program. Once identified it's often possible for developers to alter, avoid, or even drop the offending hot paths. Each method in the hot path is identified with a flame in the graph shown above.


Finding the Hotness

Hot paths are often a good place to start optimizing. To find the hot paths, developers create a Performance Session in Visual Studio. Once created, a Performance Session runs to completion and then provides developers with an interactive report (shown on the right).

The report is summarized by the (1) Hot Paths panel, (2) the Functions Doing Most Individual Work table, and (3) the Timeline Filter. Note that the Timeline Filter allows developers to focus the other two sections on specific time periods by selecting subsections of the entire Performance Session.

Eliminating the Hotness

Developers using Microsoft's Visual Studio, regardless of the language, now have the tools to analyze their programs and identify hot paths. However, how would they eliminate these problems? While this question cannot be answered generically the good news is that hot paths are usually easy to eliminate. Whether developers must leverage a more efficient data structure, break their algorithm, or even eliminate unnecessary calls they are usually well-equipped to address these types of problems. Microsoft's profiling tools are a great aid to the optimizing developer.



Communications and Sharing Knowledge Bits

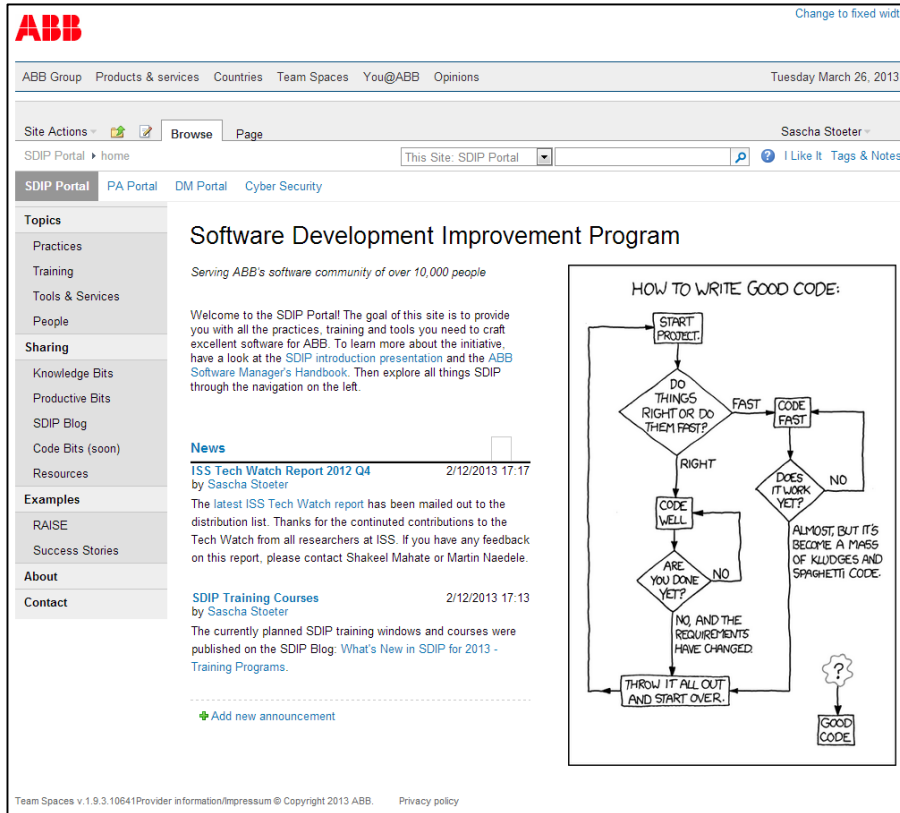
The screenshot shows the ABB Knowledgebits website. The header includes the ABB logo and the tagline "Power and productivity for a better world". The main content area is titled "knowledgebits" and features a search bar and navigation tabs for "questions", "tags", and "users". A list of questions is displayed, each with a question number, a green box indicating the number of answers, and a question title. A blue overlay box in the center of the page contains the following statistics:

- 250–400 unique users per months
- 3–4 visits per month and user
- 65 questions
- 100 answers
- 150 comments
- 3 unanswered questions

The right sidebar contains a section for "Ask a question" and a list of "Most recently updated questions" with 22 questions and 28 answers. Below this is a "Getting started" section and a "Useful links" section.

SDIP Portal

One stop shop for all things SDIP



The screenshot shows the ABB SDIP Portal homepage. The header includes the ABB logo, navigation links (ABB Group, Products & services, Countries, Team Spaces, You@ABB, Opinions), and the date Tuesday March 26, 2013. The main content area is titled "Software Development Improvement Program" and includes a welcome message, a "News" section with two articles, and a sidebar with various links and categories. A flowchart titled "HOW TO WRITE GOOD CODE:" is also displayed.

ABB

ABB Group Products & services Countries Team Spaces You@ABB Opinions Tuesday March 26, 2013

Site Actions Browse Page Sascha Stoeter

SDIP Portal home This Site: SDIP Portal I Like It Tags & Notes

SDIP Portal PA Portal DM Portal Cyber Security

Topics

- Practices
- Training
- Tools & Services
- People

Sharing

- Knowledge Bits
- Productive Bits
- SDIP Blog
- Code Bits (soon)
- Resources

Examples

- RAISE
- Success Stories

About

Contact

Software Development Improvement Program

Serving ABB's software community of over 10,000 people

Welcome to the SDIP Portal! The goal of this site is to provide you with all the practices, training and tools you need to craft excellent software for ABB. To learn more about the initiative, have a look at the [SDIP introduction presentation](#) and the [ABB Software Manager's Handbook](#). Then explore all things SDIP through the navigation on the left.

News

ISS Tech Watch Report 2012 Q4 2/12/2013 17:17 by Sascha Stoeter

The latest ISS Tech Watch report has been mailed out to the distribution list. Thanks for the continued contributions to the Tech Watch from all researchers at ISS. If you have any feedback on this report, please contact Shakeel Mahate or Martin Naedele.

SDIP Training Courses 2/12/2013 17:13 by Sascha Stoeter

The currently planned SDIP training windows and courses were published on the SDIP Blog: [What's New in SDIP for 2013 - Training Programs](#).

[Add new announcement](#)

HOW TO WRITE GOOD CODE:

```
graph TD
    Start([START PROTECT]) --> Decision1{DO THINGS RIGHT OR DO THEM FAST?}
    Decision1 -- FAST --> CodeFast[CODE FAST]
    CodeFast --> Decision2{DOES IT WORK YET?}
    Decision2 -- NO --> Decision1
    Decision2 -- ALMOST, BUT IT'S BECOME A MASS OF KLUDGES AND SPAGHETTI CODE. --> ThrowOut[THROW IT ALL OUT AND START OVER.]
    Decision1 -- RIGHT --> CodeWell[CODE WELL]
    CodeWell --> Decision3{ARE YOU DONE YET?}
    Decision3 -- NO --> Decision1
    Decision3 -- NO, AND THE REQUIREMENTS HAVE CHANGED. --> ThrowOut
    Decision3 -- YES --> GoodCode[GOOD CODE]
```

- Information consolidated in single site
- Cross-referenced information (practices, training, tools, people)
- Tailored views (eg, courses for managers)

Practices

Practices

Site Actions

Browse

Page

Sascha Stoeter

SDIP Portal

Practices

This Site: SDIP Portal

I Like It

Tags & Notes

SDIP Portal

PA Portal

DM Portal

LP Portal

Cyber Security

Topics

Practices

Training

Tools & Services

People

Sharing

Knowledge Bits

Productive Bits

SDIP Blog

Code Bits (soon)

Resources

Examples

RAISE

Success Stories

About

Practices


A practice describes the recommended way of executing an activity by joining people with a process description and tools. A typical practice is comprised of a description, available training, tools, SMEs, references and a link to a support community. It comes with an implementation plan and metrics to meet to demonstrate successful implementation. Depending on your organization's starting point, some practices can take a significant effort to be implemented. Others are as simple as picking a coding standard with no follow up actions.

Different practices affect different areas of the software development lifecycle and are not restricted to software developers. They touch on engineering, business decisions, project management and support. Likewise they are relevant for software engineers, product and line managers, architects and many more roles.

There are two sets of practices: mandatory practices that all teams must follow and a backlog of recommended, but optional practices. Occasionally practices are selected to become mandatory in accordance with the [roadmap](#) and the state of practice implementation throughout the company.

Learn more about individual practices, including the [actions to take](#), by selecting an entry from the list.


I COULD RESTRUCTURE THE PROGRAM'S FLOW OR USE ONE LITTLE 'GOTO' INSTEAD.

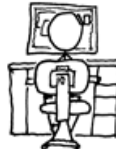



EH, SCREW GOOD PRACTICE. HOW BAD CAN IT BE?

goto main_sub3;

* COMPILER *











Practice description

The screenshot shows the SDIP Portal website. At the top, there's a navigation bar with 'Site Actions' (containing icons for a folder and a document), 'Browse', and 'Page'. On the right of this bar is the user name 'Sascha Stoeter'. Below this is a search bar with the text 'This Site: SDIP Portal' and a search icon. To the right of the search bar are links for 'I Like It', 'Tags & Notes', and a question mark icon. Below the navigation bar is a horizontal menu with 'SDIP Portal' (highlighted), 'PA Portal', 'DM Portal', 'LP Portal', and 'Cyber Security'. On the left side, there's a sidebar with a 'Topics' section containing 'Practices', 'Training', 'Tools & Services', and 'People'. Below this is a 'Sharing' section with 'Knowledge Bits', 'Productive Bits', 'SDIP Blog', 'Code Bits (soon)', and 'Resources'. At the bottom of the sidebar is an 'Examples' section. The main content area has a large heading 'Coding Standards'. To the left of this heading is a 'Contents' box with a list: '1 Description', '2 Tools', '3 Training', '4 Actions', and '5 References'. To the right of the heading is a 'Coding Standards' table. Below the heading is a 'Description' section with two paragraphs of text. The website has a torn paper effect at the top and bottom edges.

Site Actions   Browse Page Sascha Stoeter

SDIP Portal ▾ This Site: SDIP Portal   I Like It Tags & Notes

SDIP Portal PA Portal DM Portal LP Portal Cyber Security

Topics

- Practices
- Training
- Tools & Services
- People

Sharing

- Knowledge Bits
- Productive Bits
- SDIP Blog
- Code Bits (soon)
- Resources

Examples

Coding Standards

Contents

- [1 Description](#)
- [2 Tools](#)
- [3 Training](#)
- [4 Actions](#)
- [5 References](#)

Version	1
Release year	2012
SME	Sascha Stoeter
Knowledge Bits	implementation tag
Area	Design and Implementation
Functions	Development


Description

Each team must define and follow a common coding standard.

A coding standard makes code reviews more efficient.

IP does not recommend a particular standard. It only states that each team must define and follow a common coding standard.

Coding Standards

What is Expected?	Status	Comment
Appropriate Coding Standards for applicable technologies are defined and used*		

* Coding Standards are preferably also supported and enforced by the Static Code Analysis tools used

3 Ongoing


2 Ongoing

1 Ongoing

0 Not Started

 Completed since last Baseline

Static Code Analysis

What is Expected?	Status	Comment
Use Static Code Analysis on all new and changed code		
For new and changed code, all warnings shall be analyzed and resolved	2	
Coding standards shall be enforced with the tool used	2	

What should be Measured?	Data Collected	Comment
The warning levels shall be monitored and controlled	1	

3 Ongoing

2 Ongoing

1 Ongoing

0 Not Started

 Completed since last Baseline

SPID Site/Product Line Report

Enter topics of interest to the Site

Fill out Site or Product Line

Update current quarter by changing colors

Hot Topic	Status	Comment	Key Practice	Q1	Q2	Q3	Q4
Organization and Resources	Green	Indicate status (Red, Green or Yellow of topics of choice and comment)	<p>Update current and projected status for practices (Green = Implemented, Red = To be implemented and Grey = Not applicable. (Note: No yellow!))</p> <p>Also indicate progress towards implemented using Harvey Balls</p> <p>Indicate full implementation since last report using Green Arrow</p>			Green Arrow	Green
Training Deployment	Green					Green	Green
Tool Chain Deployment	Yellow					2	3
2013 Planning and Budget	Red					2	3
<u>Ongoing Activities</u> <u>Concerns/Issues</u>			Code Review	Green	Green	Green	Green
List ongoing activities of choice and any concerns or issues			Coding Standards	Green	Green	Green	Green
			Unit Testing with Automation	1	1	3	Green
			Project and Product Metrics	2	3	3	Green
			Software Estimation	Green	Green	Green	Green
			R&D Self Assessments	Green	Green	Green	Green
			Nightly Builds	Green	Green	Green	Green
			Define and Control Interfaces	Green	Green	Green	Green

3 Ongoing

2 Ongoing

1 Ongoing

0 Not Started

Green Arrow Completed since last Baseline

Introduction to Configuration Management

Instruction Slide
Delete when not needed

What is	Status	Comment
All relevant configurations are controlled in an approved Configuration Management Tool	↑	
A set of baselines is identified and work products are baselined at given points in the product development lifecycle	2	Provide meaningful comments on the status
CM Audits are performed to ensure integrity of important baselines	2	

Update current status for practices (Green = Implemented and Red = To be implemented (Note: No yellow!))

Also indicate progress towards implemented using Harvey Balls

Indicate full implementation since last report using Green Arrow

What should be Measured?	Data Collected	Comment
Incremental Code Churn*		

* Also an SDIP Metric

3 Ongoing	2 Ongoing	1 Ongoing	0 Not Started
-----------	-----------	-----------	---------------

↑ Completed since last Baseline

Tailored views by function

Site Actions Browse Page Sascha Stoeter

SDIP Portal ▸ People This Site: SDIP Portal I Like It Tags & Notes

SDIP Portal PA Portal DM Portal LP Portal Cyber Security

Topics

- Practices
- Training
- Tools & Services
- People**

Sharing

- Knowledge Bits
- Productive Bits
- SDIP Blog
- Code Bits (soon)
- Resources

Examples

People

On a high level, SDIP differentiates the functions of

- [Development](#) (includes architecture, design and implementation)
- [People Management](#)
- [Product Management](#)
- [Project Management](#)
- [Quality Assurance](#) (includes test)

The [practices](#) and [courses](#) cross-reference these functions.

Other functions such as Research, Applications, Information Systems, Support, Marketing, HR, Legal, Sales and various other group functions are not the direct target audience for SDIP. However, anyone from these functions is welcome to participate in the software community, by taking training and getting involved in any sharing initiatives.

Software roles are reflected in the [software development career path](#), which was co-developed by SDIP and GF-HR. It is an extension of

Tools

SDIP Tools



- Convergence on single tool better than many better tools
 - Training
 - Cost
- SDIP selects and recommends tools
- Centrally administered tools
 - Installation, backups
 - Training and support
 - SME
 - Onboarding of teams
- Local power users

Training

SDIP Trainings

Professional Training in Software Engineering

SDIP

Software Development
Improvement Program

Learning Alert: SDIP Training Window Closing Soon!

50+ courses (e-learning, webinars, video, workshops)
10,000 email recipients
40% opening rate

There is still time to register for training opportunities that SDIP is offering the industry and give you alternate support to your professional development and credibility as a Software Developer. Please

Course Offerings:

Courses are available in the following focus areas of Software Development through July 31st.

SDIP210 - Applying Project Estimation Methods

-you will learn how to create comprehensive and accurate estimates!

SDIP310 - Writing Strong Functional Requirements

-you will learn how to define clear and unambiguous requirements!

SDIP320 - Writing Strong Non-functional Requirements

-you will learn how to best define non-functional requirements!

SDIP330 - Static Analysis of Code

SDIP Training Program

Training Windows 2013

- Initial Promo (all self paced courses): Jan+, *sent Jan 25th*
 - New: HP ALM 11.5 e-learnings, Klocwork instructional videos
 - Black Duck e-learnings, HP Service Manager
- 1st Window: Feb/March – *promo Feb 4, classes Feb 18-Mar 28*
 - New: SCRUM Software Development
 - Existing: Requirements, Architecture
- 2nd Window: April/May – *promo April 2, classes April 16-May 23*
 - New: Leading Product Development Improvement, Business Scenarios & User Stories
 - Existing: Unit Testing, Quality Assurance, Static Analysis
- 3rd Window: ...

SDIP Training Program

Global Participation Statistics – 2013 Year to Date

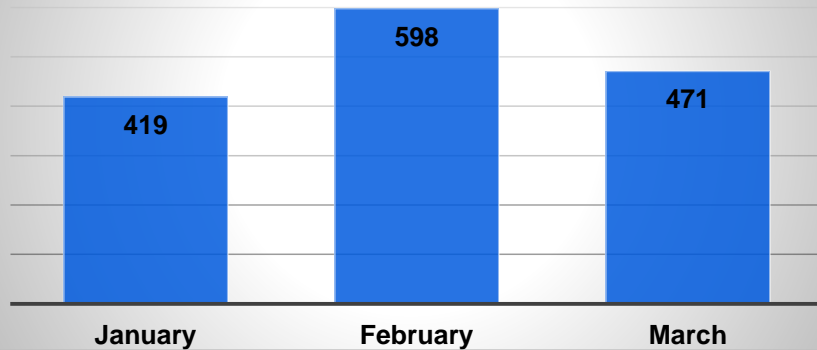
Key Training Metrics	2012	1Q13	2Q13	3Q13	4Q13
Total Enrollment	4,615	1,487			
Total Enrollment TD	5,142	6,629			
New Students	1,654	355			
Unique Students TD	1,654	2,009			
Webinars delivered	98	17			
Average Students per Webinar	17	24			
Webinars cancelled	27	0			
Webinar No Show Rate	19%	28%			
Countries Participating	45	34			

TD = to date

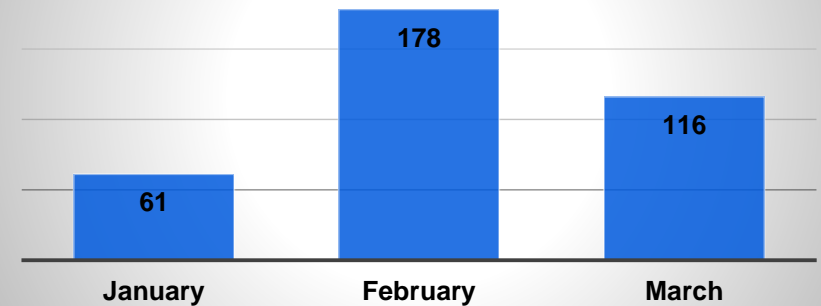
SDIP Training Program

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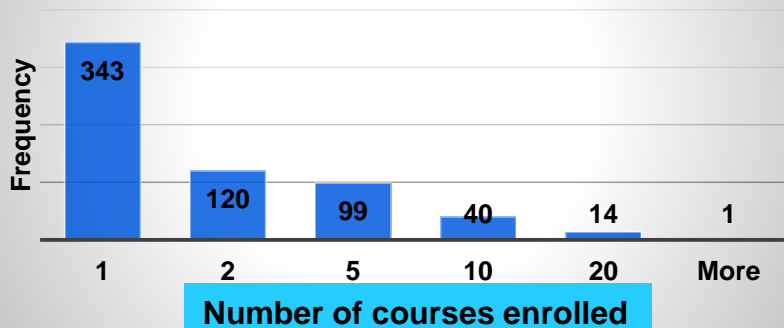
Students by Month



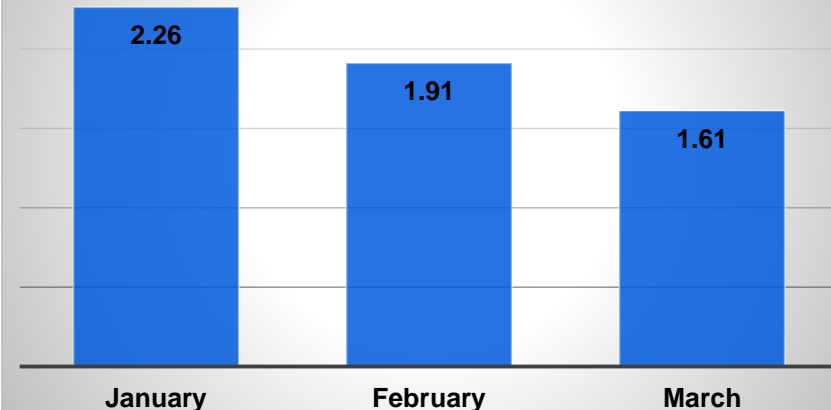
New Students / Month



Histogram of Courses / Student



Average Courses / Student



SDIP Training Program

Participation by Country – 2013 Year to Date

United States	394
India	278
Sweden	134
Switzerland	110
Germany	104
Poland	85
China	63
Finland	62
<i>Unknown</i>	40
Norway	39
Italy	35
Canada	33
France	18
Australia	18
Ireland	9
Estonia	9
Czech Republic	7

Singapore	7
Croatia	7
Brazil	6
Spain	6
Netherlands	5
United Kingdom	4
Mexico	3
Russian Federation	2
Korea, Republic of	1
Colombia	1
Denmark	1
Saudi Arabia	1
Oman	1
Vietnam	1
Chile	1
Qatar	1
Japan	1

SDIP Training Program

Student Evaluation Results – 2012 Yearly Totals

Evaluation Question	Very Good	Good	Neutral	Poor	Very Poor
Overall how would you rate the content of this course?	19%	55%	22%	4%	0%

Evaluation Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The instructors of this course were knowledgeable?	36%	54%	7%	2%	1%
The instructors' had a positive impact on my understanding of the material?	26%	55%	16%	2%	1%
The Webinar content was well organized?	28%	59%	11%	2%	0%
Provided the knowledge necessary to achieve the objectives of the course?	20%	58%	18%	4%	0%
The Webinar content was relevant to my position at ABB?	40%	45%	13%	2%	0%

Note: based on 419 student responses

← Overall student satisfaction →
95%

SDIP Training Program

Student Evaluation Results – 2012 Yearly Totals (con't)

Evaluation Question	Way Too Fast	A Bit Too Fast	Just Right	A Bit Too Slow	Way Too Slow
Overall; how would you rate the pace of this course?	2%	8%	73%	14%	3%

Evaluation Question	Not Enough	Just Right	Too Much
Overall; how would you rate the level of interaction in this course	10%	87%	3%

Evaluation Question	Too Few	Just Right	Too Many
Overall; how would you rate the number of examples in this course	7%	85%	8%

Which topic or element in the Webinar do you feel will be most useful to your work at ABB?

Answer	Number	Percent
General course content	182	45%
Instructor led examples	139	34%
Participant exercises	86	21%

Summary

Summary

- Achievements
 - Traction and recognition in company
- Challenges
 - Building a community
 - Making ABB a known and desired workplace place for software engineers
- Lessons learned
 - Small core team can have an impact in a large organization
 - Carrot wins over stick (but peer pressure helps)
- Open question
 - Potential improvements through disruptive organizational changes

Power and productivity
for a better world™

