Programming Basics for AEC

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Introduction

- Stewart Raleigh, NC
- Civil Engineering EI
- North Carolina State University class of 2014
- Passion for fully utilizing design technology in Land Development Industry
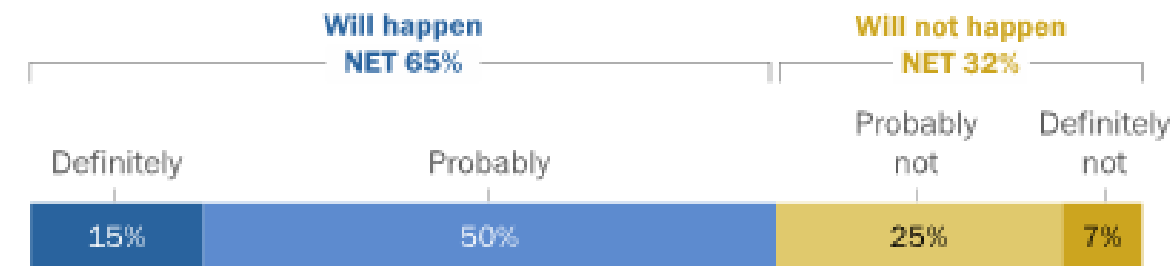
Class summary

- Designers increasingly asked to understand code, and some even needing to write it themselves. But, how do you do that? You start with the fundamentals of programming—don't worry about which language to start in. Worry about learning the general concepts of programming. Worry about learning how to find the information you need. Learn how to teach yourself coding basics. This class will present the basics of any programming language, how to think programmatically, and the basics of developing software. We'll even introduce some tools for development beyond the code itself. You learn the meaning of terms like: loops, strings, variable, globals, API, and extents testing.

Motivation

- Personal workflow efficiency
- Opportunity for Innovation in our industry
- Understand the machines!

Two-thirds of Americans expect that robots and computers will do much of the work currently done by humans within 50 years ...

% of adults who say that in the next 50 years robots and computers will do much of the work currently done by humans

Will happen
NET 65%

Will not happen
NET 32%

Definitely	Probably	Probably not	Definitely not
15%	50%	25%	7%

... but most workers expect that their own jobs will exist in their current forms in five decades

% of workers who say the jobs/professions they work in now will/will not exist in 50 years

Will exist
NET 80%

Will not exist
NET 18%

Definitely	Probably	Probably not	Definitely not
36	44	12	6
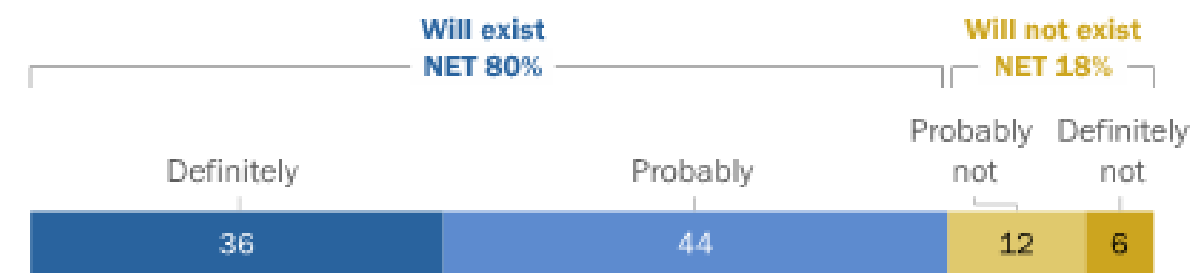
Note: Second chart based on those who are currently employed on a full- or part-time basis

Source: Survey conducted June 10-July 12, 2015.

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Key learning objectives

At the end of this class, you will be able to:

- Understand Programming Concepts
- Discuss various programming languages and their uses
- Apply the basics of software development
- Understand the opportunity for programming related to AutoCAD applications

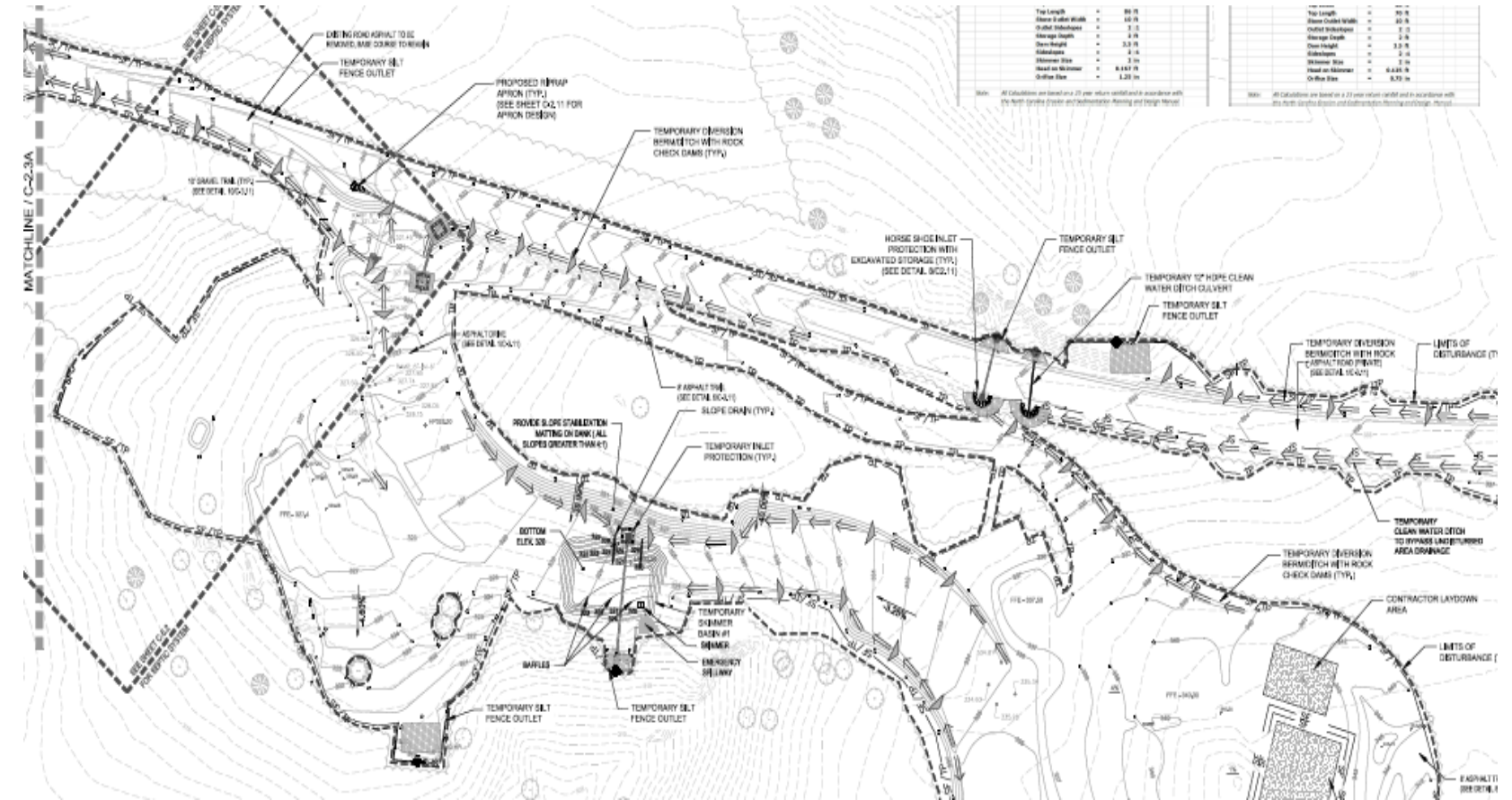# Fundamental Programing Concepts

- Functions
- Objects
- Inheritance
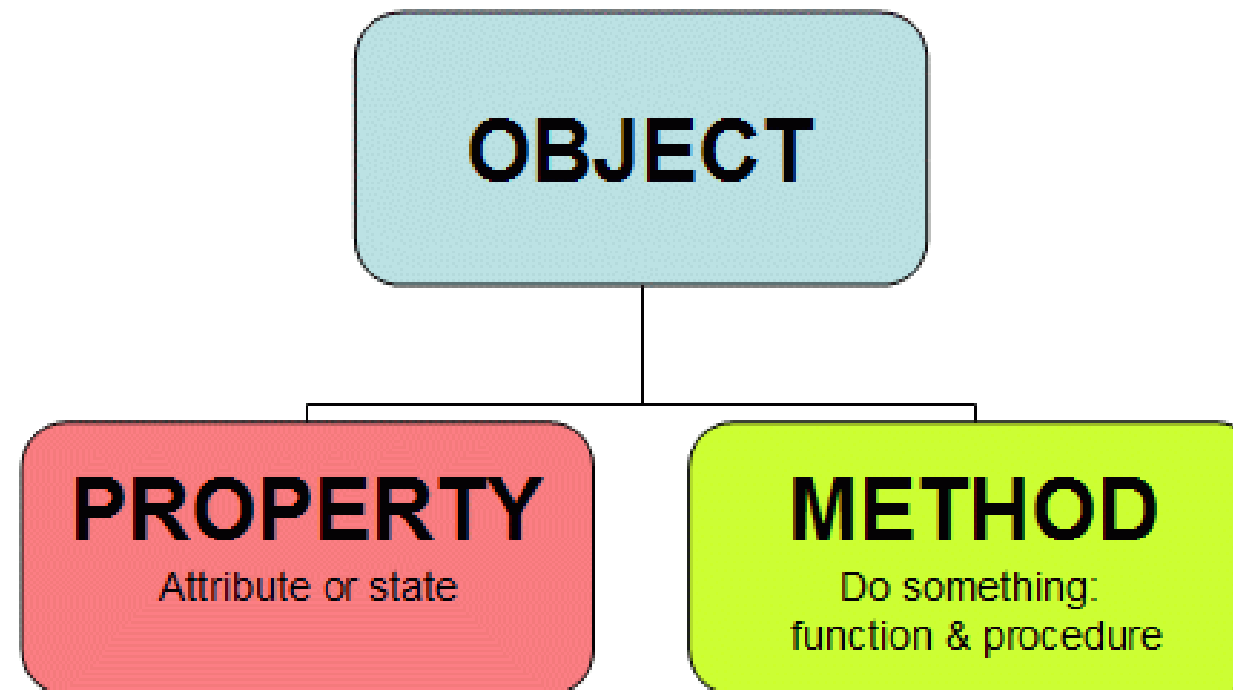- Loops and Conditions
- Modules and Packages
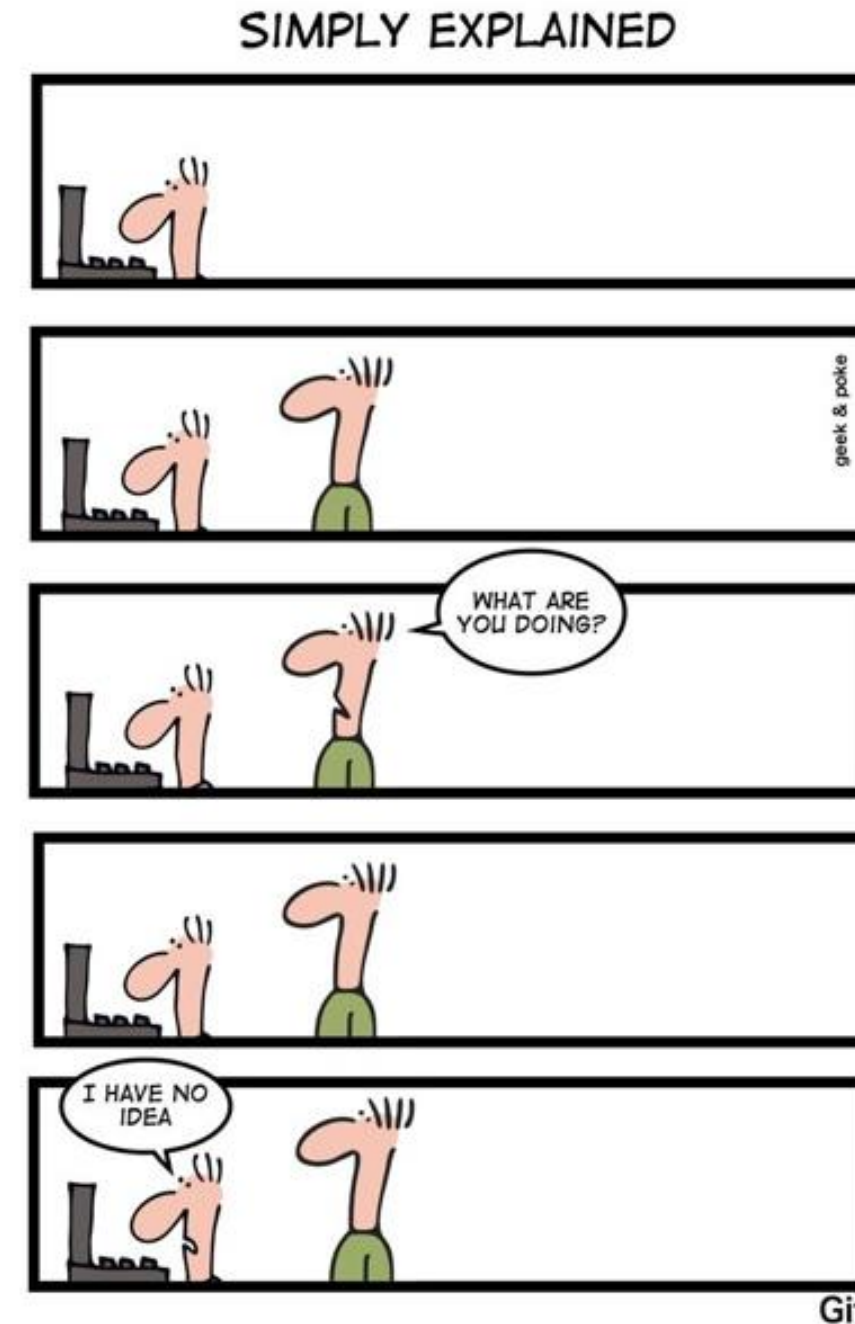
Functions

- Commonly used routine
- Identifying repetitive processes
- Create plan of attack
- Be lazy and smart!
- Start with our very good friend Excel!
- True functions in an OOP

EXCEL

Objects & Object Oriented Programming

- Relating virtual pieces of information to something tangible
- The nouns of a program

Inheritance

- After defining a class, any subclass can inherit the definitions of one or more general classes.
- Requires practice to identify opportunity for implementation
- Becomes a roadblock in reading code and understanding the logic for many.
- "Families" of Classes

Loops and Conditions

- The performing logic in a program.
- Loops are Iterative operations until certain conditions are being met
- Conditions are simple checks that evaluate the state of an object or variable

Environments, Modules and Packages

- Packages and modules are sets of tools organized by their functionality that can be imported for use.
- Don't re-invent the wheel!
- Autodesk "My First Plug-in" is a tutorial on installing Visual Studio and importing Autodesk tools.

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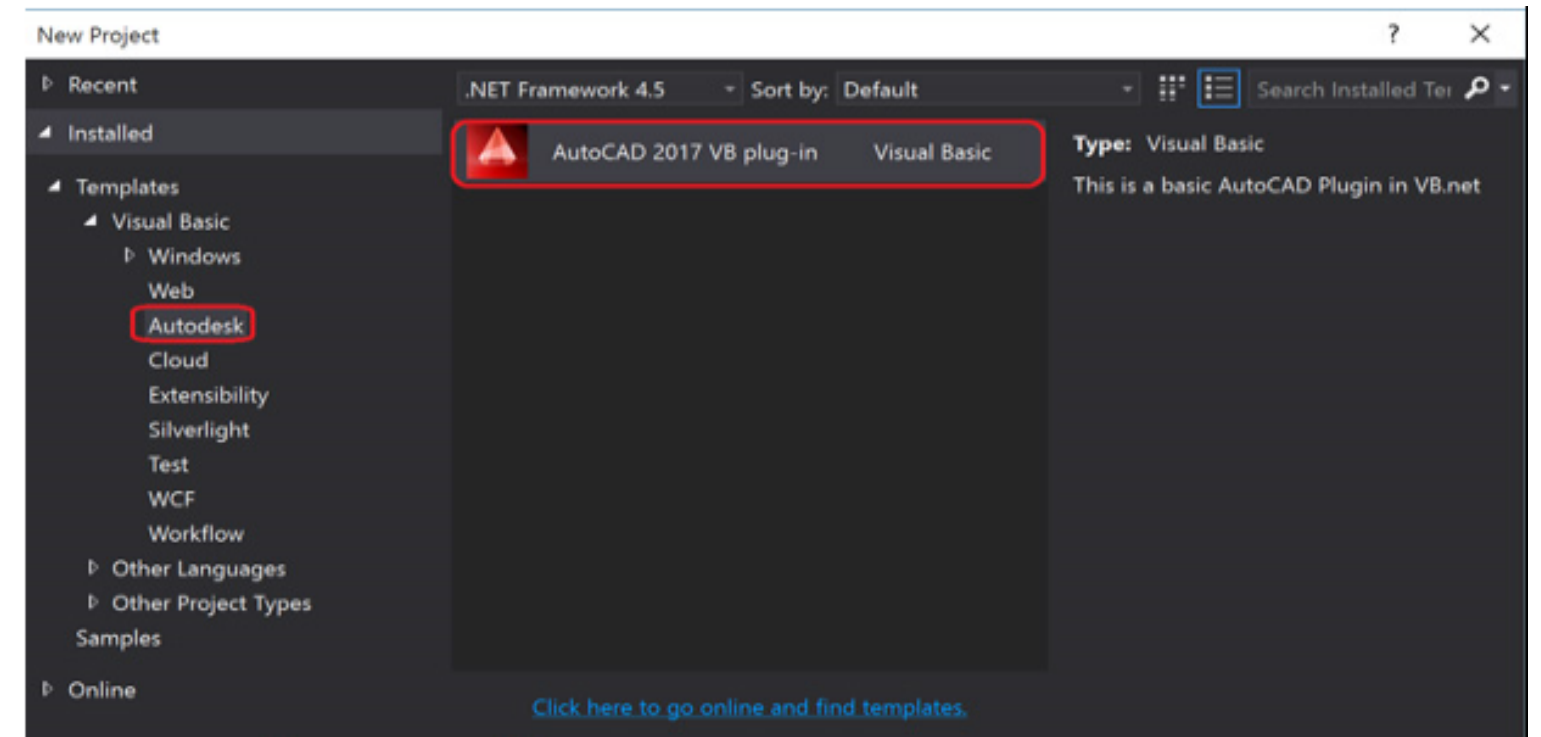
Programming Languages and Their Purposes
Web Languages

- HTML – The standard markup language for creating web pages and web applications
- JavaScript – Interpreted programming language for web content production
- Python – Popular, high level, general purpose, object oriented programming language
- PHP – Server-side scripting language used mostly in web development
- Ruby – Popular, high level, general purpose, object oriented programming language

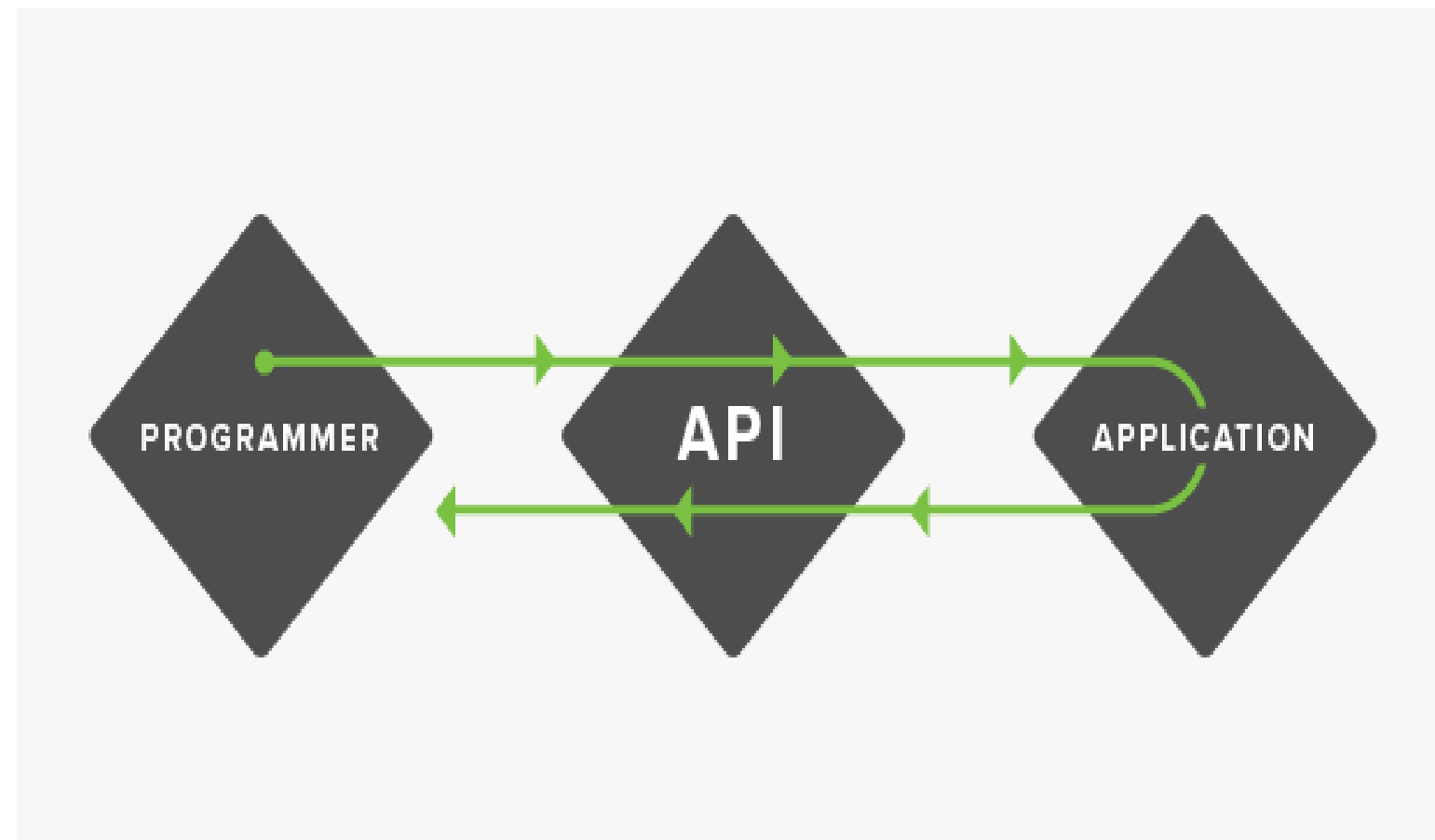# Programming Languages and Their Purposes
AutoCAD Languages

- Auto LISP – Macro programming language for limited and specific tasks within AutoCAD
- Visual Basic .NET – .NET object oriented language designed for rapid application development and shallow learning curve
- C# - .NET object oriented language designed to be simple, powerful, and versatile.
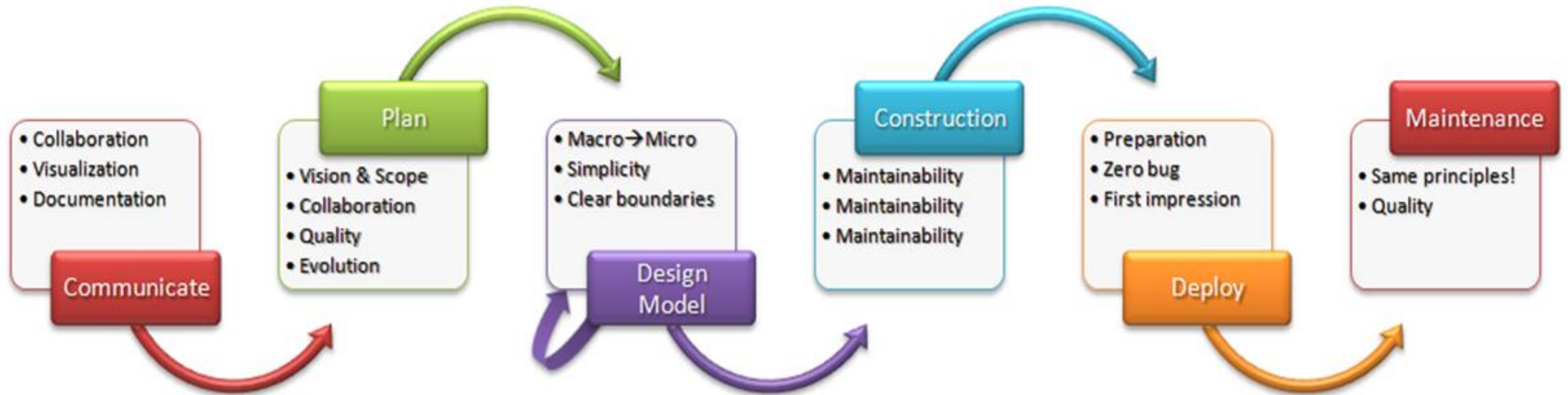
Programming in AutoCAD

- Macros – List of instructions, ususally commonly used sequence of commands and options that is run from the AutoCAD UI
- Scripts – An ASCII text file containing instruction for AutoCAD to perform at the command line
- Plug-ins - .NET enhanced functionality, custom commands/tools.

What is this 'API' I hear so much about?

- Application Programming Interface
- Infrastructure for developing custom tools

Basics of Software Development

- Collaboration
- Visualization
- Documentation

Communicate

Plan
- Vision & Scope
- Collaboration
- Quality
- Evolution

- Macro→Micro
- Simplicity
- Clear boundaries

Design Model

Construction
- Maintainability
- Maintainability
- Maintainability

- Preparation
- Zero bug
- First impression

Deploy

Maintenance
- Same principles!
- Quality

Basics of Software Development

- Talk to the End User
- Put something in front of them ASAP
- Find the balance between design and functionality
- Know what Autodesk is working on

Minimum Viable Product
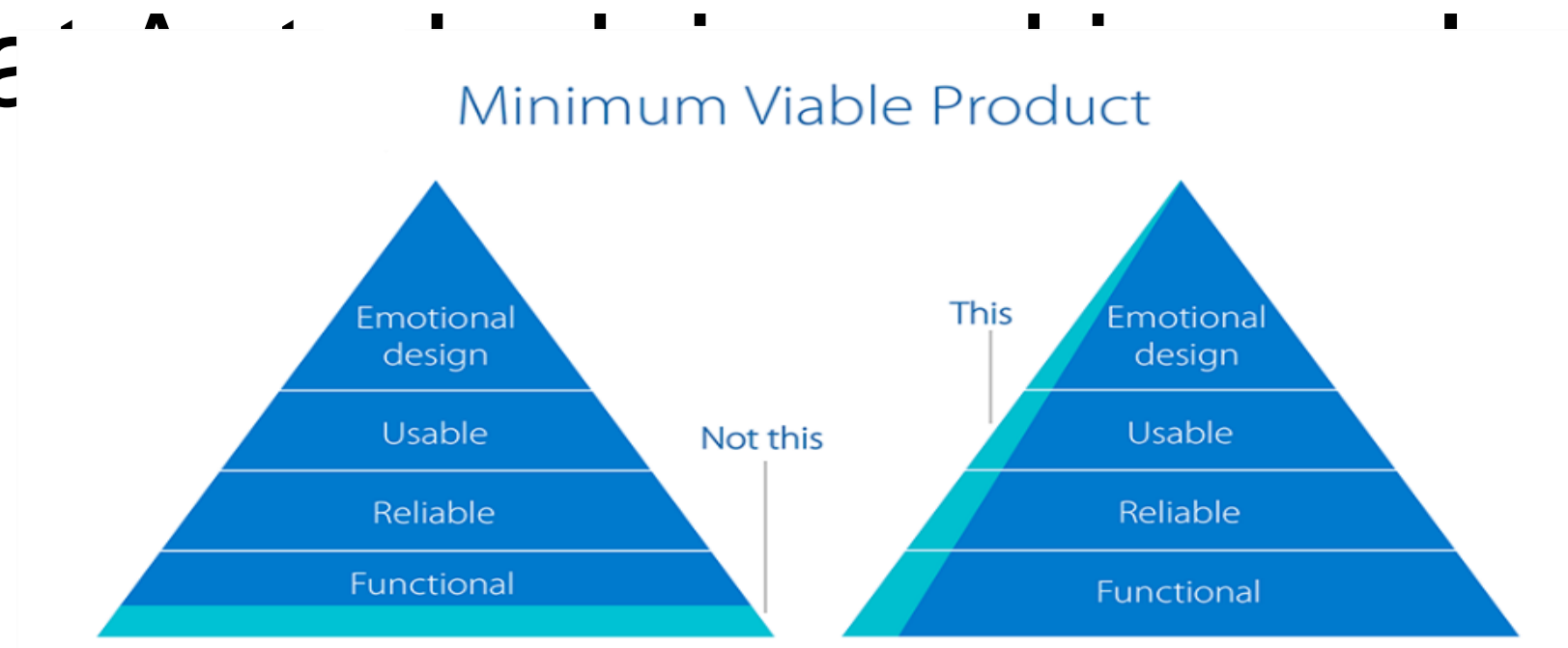
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More Questions? Visit the AU Answer Bar

- Seek answers to all of your technical product questions by visiting the **Answer Bar**.

- Open daily from **8am-6pm Tuesday** and **Wednesday**; **8am-4:30pm Thursday**.

- Located outside **Hall C, Level 2**.

- Meet Autodesk developers, testers, & support engineers ready to help with your most challenging technical questions.

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How did I do?

- Your class feedback is critical. Fill out a **class survey** now.

- Use the AU mobile app or fill out a class survey online.

- Give feedback after each session.

- AU speakers will get feedback in real-time.

- **Your feedback results in better classes and a better AU experience.**

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