

Using Flowcharts for Algorithms

John R. Wright, Jr., PhD, CSTM, CLSSGB, CSCE, F.ATMAE
AENG 467, Mobile Robotics
Millersville University

Algorithms, Pseudocode & Code

- An Algorithm is your plan/idea (how to solve a problem)
 - May be expressed in many different ways
 - Mathematical Expression
 - Pseudo Code (written text)
- Pseudocode is the written expression of the Algorithm
 - It is simply a description on how your program should work in plain English or another language
- Code – this is what you program (Syntax) to enact your algorithms
- Other notes:
 - Some people are great at code
 - Some are great at developing algorithms
 - Innovation really comes great algorithms!
 - Optimization comes from great code!

Flowcharting

- Flowcharts allow one to see a pictorial representation of the process.
- They make it easier to understand the process at hand!
- MS Visio is a great tool for developing flowcharts as you can easily drag and drop the symbols.

Flowchart Symbols



Terminator
Indicates the beginning or end of a program flow in your diagram.



Process
Indicates any processing function.



Decision
Indicates a decision point between two or more paths in a flowchart.



Delay
Indicates a delay in the process.



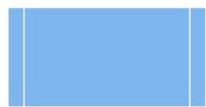
Data
Can represent any type of data in a flowchart.



Document
Indicates data that can be read by people, such as printed output.



Multiple documents
Indicates multiple documents.



Subroutine
Indicates a predefined (named) process, such as a subroutine or a module.



Preparation
Indicates a modification to a process, such as setting a switch or initializing a routine.



Display
Indicates data that is displayed for people to read, such as data on a monitor or projector screen.



Manual input
Indicates any operation that is performed manually (by a person).



Manual loop
Indicates a sequence of commands that will continue to repeat until stopped manually.



Loop limit
Indicates the start of a loop. Flip the shape vertically to indicate the end of a loop.



Stored data
Indicates any type of stored data.



Connector
Indicates an inspection point.



Off-page connector
Use this shape to create a cross-reference and hyperlink from a process on one page to a process on another page.



Off-page connector



Off-page connector



Off-page connector



Or
Logical OR



Summing junction
Logical AND



Collate
Indicates a step that organizes data into a standard format.



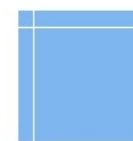
Sort
Indicates a step that organizes items list sequentially.



Merge
Indicates a step that combines multiple sets into one.



Database
Indicates a list of information with a standard structure that allows for searching and sorting.



Internal storage
Indicates an internal storage device.

Visio Basic Flowchart Shapes



File Home Insert Design Data Process Review View Developer

Clipboard Font Paragraph Tools Shape Arrange Editing Visio Guy

Calibri 8pt. A A⁺ A⁻ B I U abc Aa A

Pointer Tool Connector Text Fill Line Shadow Auto Align & Space Position

Shapes

Search for Shapes

More Shapes

Quick Shapes

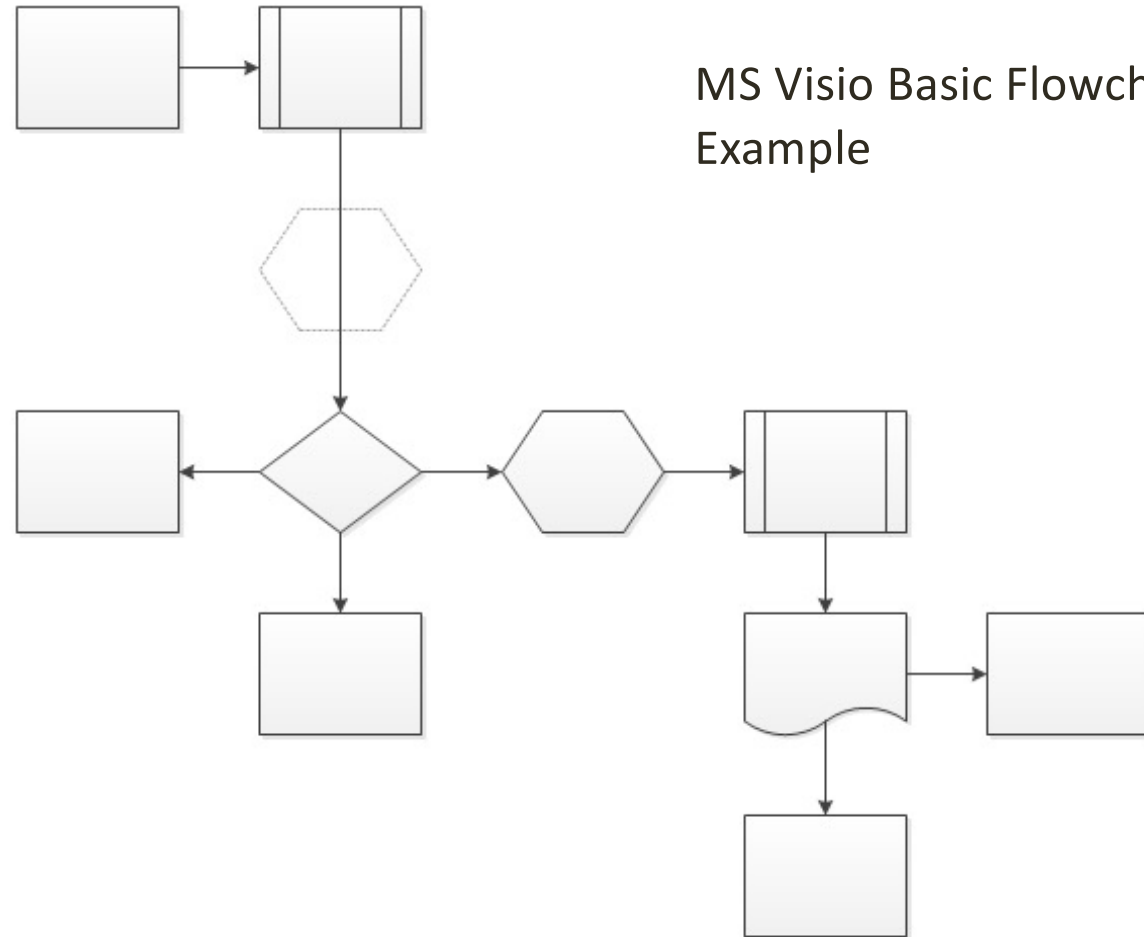
Basic Flowchart Shapes (US units)

Cross-Functional Flowchart Shapes (US units)

Basic Flowchart Shapes (US units)

Process	Decision
Subprocess	Start/End
Document	Data
Database	External Data
Custom 1	Custom 2
Custom 3	Custom 4
On-page reference	Off-page reference

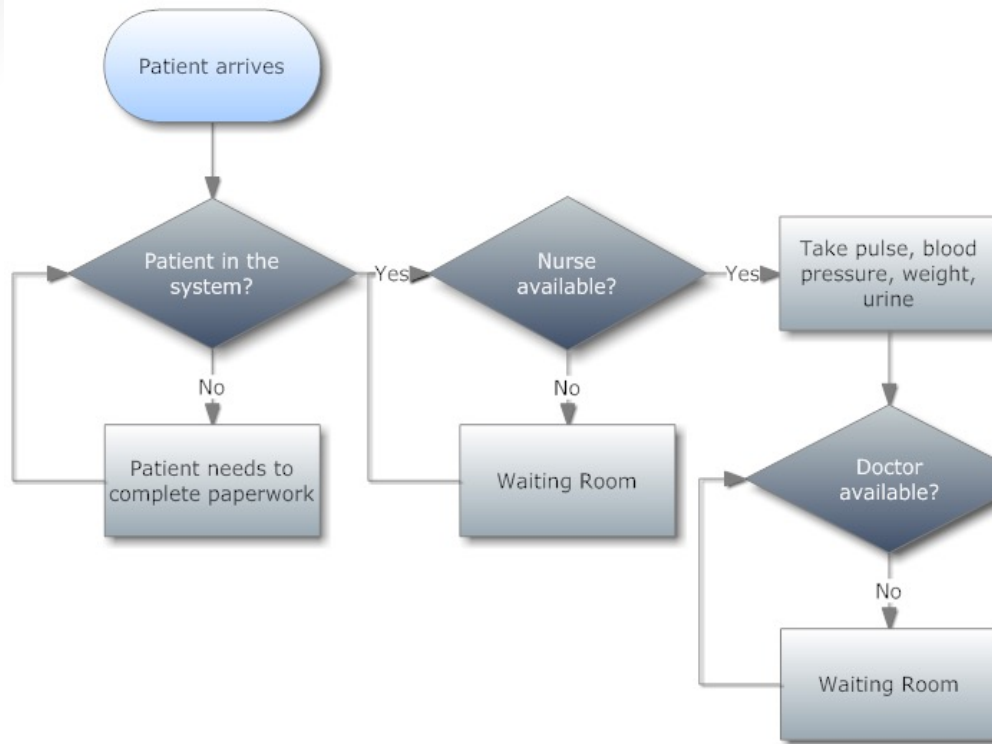
MS Visio Basic Flowchart Example



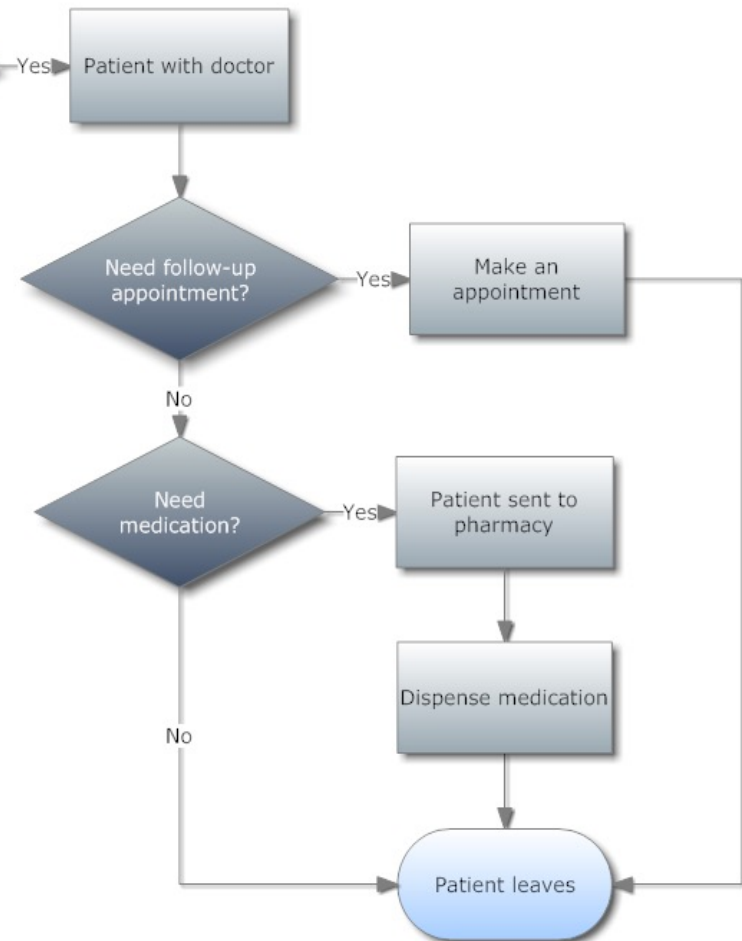
http://www.sawyoo.com/postpic/2015/03/visio-flowchart-shapes_206705.png

Shape Data - ThePage

No Shape Data



Smartdraw Flowchart Example

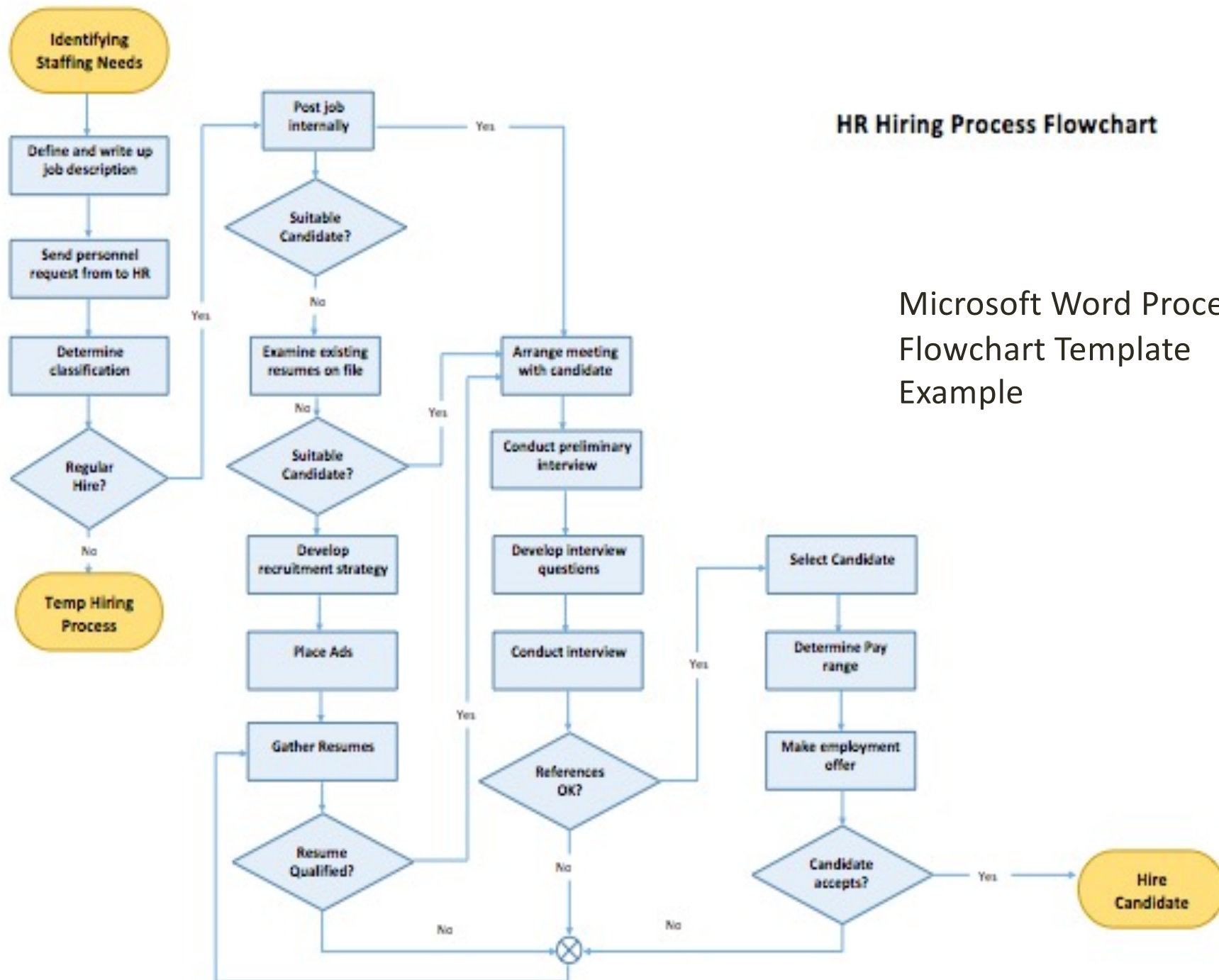


Medical Services



HR Hiring Process Flowchart

Microsoft Word Process Flowchart Template Example



Flowcharting Resources

- MS Visio 2016 Tutorial
 - <https://www.youtube.com/watch?v=b09dKHvu4-4>

Common Errors

- Arrows / Flow issues
 - Missing
 - Direction
 - Decision Symbols
- Incorrect Symbol usage
 - Documentation vs Process
 - Think of documentation as a special type of process that has a special symbol
 - Decision
 - Label them
 - Cleaner to use one line per joint
 - Subprocess vs Process
 - Subprocess symbols will require another flowchart
 - Continuation References
 - On or off page symbols