

# Extending Adobe Captivate With JavaScript

Advanced techniques From A web developer's perspective

<https://github.com/sdwarwick/captivate-demos>

# Audience

- Learning interaction designers
- Project managers / Course strategy developers
- Web Developers
- eLearning methodology strategists
- Content Authors

# Context

- Captivate
- HTML projects
- “Responsive” design
- Windows 10 development environment
- JavaScript ECMA 2015
- Chrome browser
- Notepad++ text editor

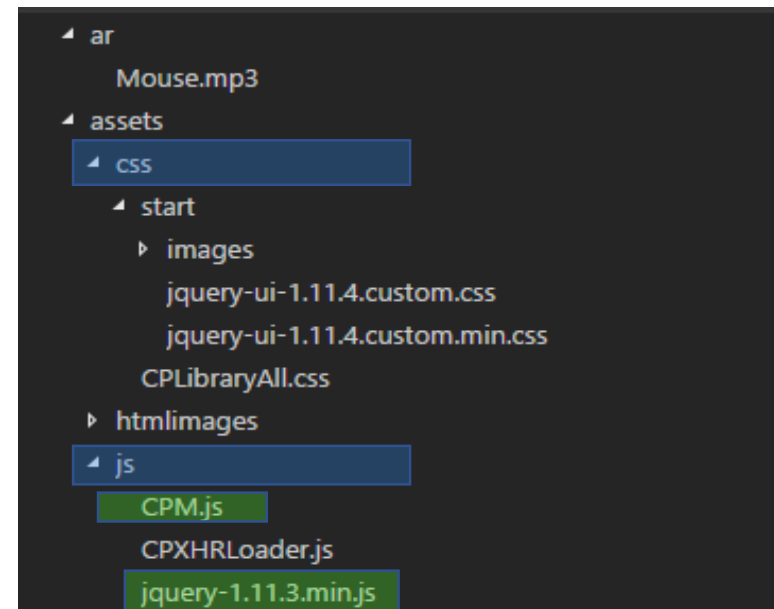
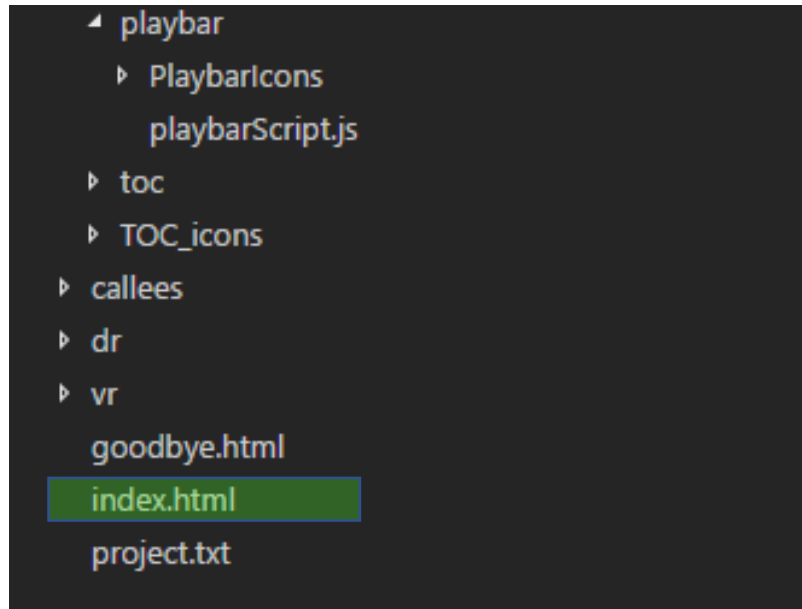
# Plan

- Captivate as a web development platform
  - JavaScript as a development tool
- Efficient development of JavaScript/Captivate scripts
  - External JavaScript files
  - Debugging in Chrome
- Example Scripts
  - Fully custom quiz interactions
  - Full-screen mode
  - D&D
- Overview of other possibilities with JavaScript
- Adobe documented vs. undocumented functions
  - Decompressing CPM.js
- The CPM.js file and implications for development
  - Bridging between JavaScript and Captivate
- Questions

# Captivate from the web developers perspective

- WYSIWYG website builders:
  - “Closed” builders generate sites that cannot easily be modified after being generated
    - Easy to get started building, limited access to potential of modern design
    - Weebly, Wix, Squarespace
  - “Open” builders support direct modification of generated sites & continued editing
    - Deeper understanding of web technologies needed
    - Pinegrow, Bootstrap Studio, Bootply
- Captivate – 90% closed / 10% open
- Custom features valuable for eLearning
- Reasonable strategy given initial target audience

# Anatomy of a Website (Captivate File Layout)



- A module produced by Captivate is structured in a very common website design style
- A zipped module is simply a single-file version of this exact directory structure
- When a captivate module is loaded into an LMS, the zip file is simply uncompressed by the LMS
- Websites typically need to be “served” by a server program (apache/nginx) in case external content needs to be loaded
- When all content is inside the module directory, a browser can be used to view the website (file://)

# Anatomy of a Captivate Website

## HTML

```
<body>
  <div id="mobile-sidebar" class="visible-xs ...>
    <a class="mobile-sidebar-header" href="#">
      {{template "cogname" .}}
    </a>
    <div class="mobile-sidebar-content">
      <ul class="frow column-start">
        <ul class="frow centered menuSel">
          <li><a href="#overview">Over
          <li><a href="#service">Servi
          <li><a href="#customers">Cus
          <li><a href="#about">About</
        </ul>
      </ul>
    </div>
  </div>
  <div id="click-cover" class="visible-xs lets
```

## CSS

```
{
  background:url('../Playbar_icons/Play_icon.png')
  width:58px;
  height:59px;
  float:left;
  position:absolute;
  left:50px;
}
.playButton: hover
{
  background:url('../Playbar_icons/Play_icon.png')
  width:58px;
  height:59px;
  float:left;
  position:absolute;
  left:50px;
}
```

## Javascript

```
};
(function (i, m) {
  var b = function (a, c) {
    return new b.Instance(a, c || {})
  };
  b.defaults = {
    stop_browser_behavior: {
      userSelect: "none",
      touchAction: "none",
      touchCallout: "none",
      contentZooming: "none",
      userDrag: "none",
      tapHighlightColor: "rgba(0,0,0,0)"
    }
  };
  b.HAS_POINTEREVENTS = i.navigator.pointerE
  b.HAS_TOUCHEVENTS = "ontouchstart" in i;
  b.MOBILE_REGEX = (mobile|tablet|ip(ad|hone|p
```

- Same structures are seen in Captivate as in all websites
- “CPM.js” file contains
  - All content data – shapes, text, timing, placement, quiz
  - Captivate JavaScript Library that “runs” the website
  - Since the file is compressed, it is hard to decipher

# Why JavaScript?

- Most popular programming language – StackOverflow / Github
- Used for both user interaction in browser and business logic on server
  - Access all the power of the browser
- Completely free development environment
- All Browsers have powerful, built-in debugging tools
- Very fast design/test cycle - no “publishing/compiling” process
- Most profound change in learning process – learning on demand
  - Stackoverflow <http://stackoverflow.com/insights/survey/2016>
  - 2.7Million questions, 3.2Million answers in 2015
  - Thousands of tutorials



# Why use JavaScript with Captivate

## Upside

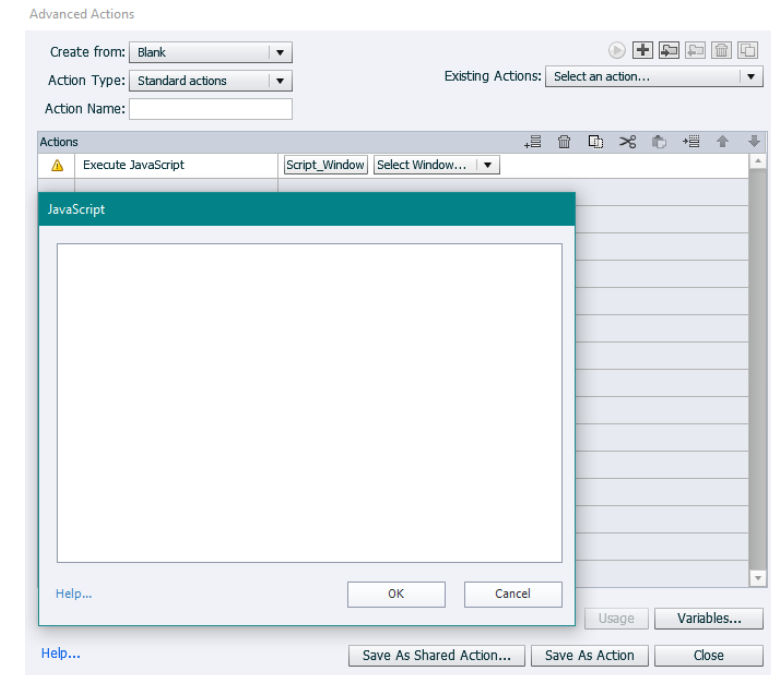
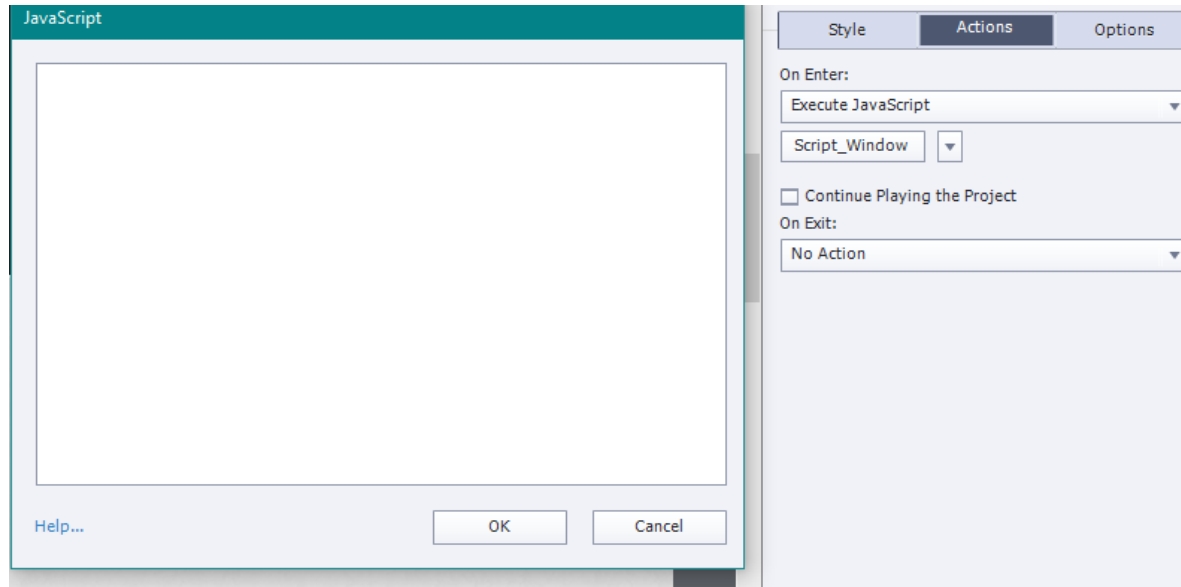
- You can control the entire user interface with JavaScript
  - Change shape properties, display notifications, react to any user event
  - Create custom quiz interactions, unique animations etc..
- JavaScript functions can be debugged while the presentation is running, unlike advanced actions
- With a trick, JavaScript functions can be updated/modified without “re-publishing” ...fast development turnaround
- Many online tutorials for using JavaScript with Captivate
  - Large subject area, no tutorial is can be comprehensive – point solutions and examples

## Downside

- Steeper learning curve
- Lots of cool stuff is undocumented by Adobe, discovered and published by developers

# How to work efficiently with javascript

- Internally supported approach: Use built-in JavaScript script window
  - No syntax checking
  - Must re-publish module to update
  - Hard to maintain, code is sprinkled throughout the modules



# How to work efficiently with javascript

- External file holds JavaScript functions
- JavaScript file is located outside the module so it won't be deleted when the module is updated
- JavaScript file is typically in the same directory that holds the module

**To connect external JavaScript file, add to the first slide “On enter execute JavaScript”**

```
$('#body').append('<script src="../multichoice.js" async="false"></script>');
```

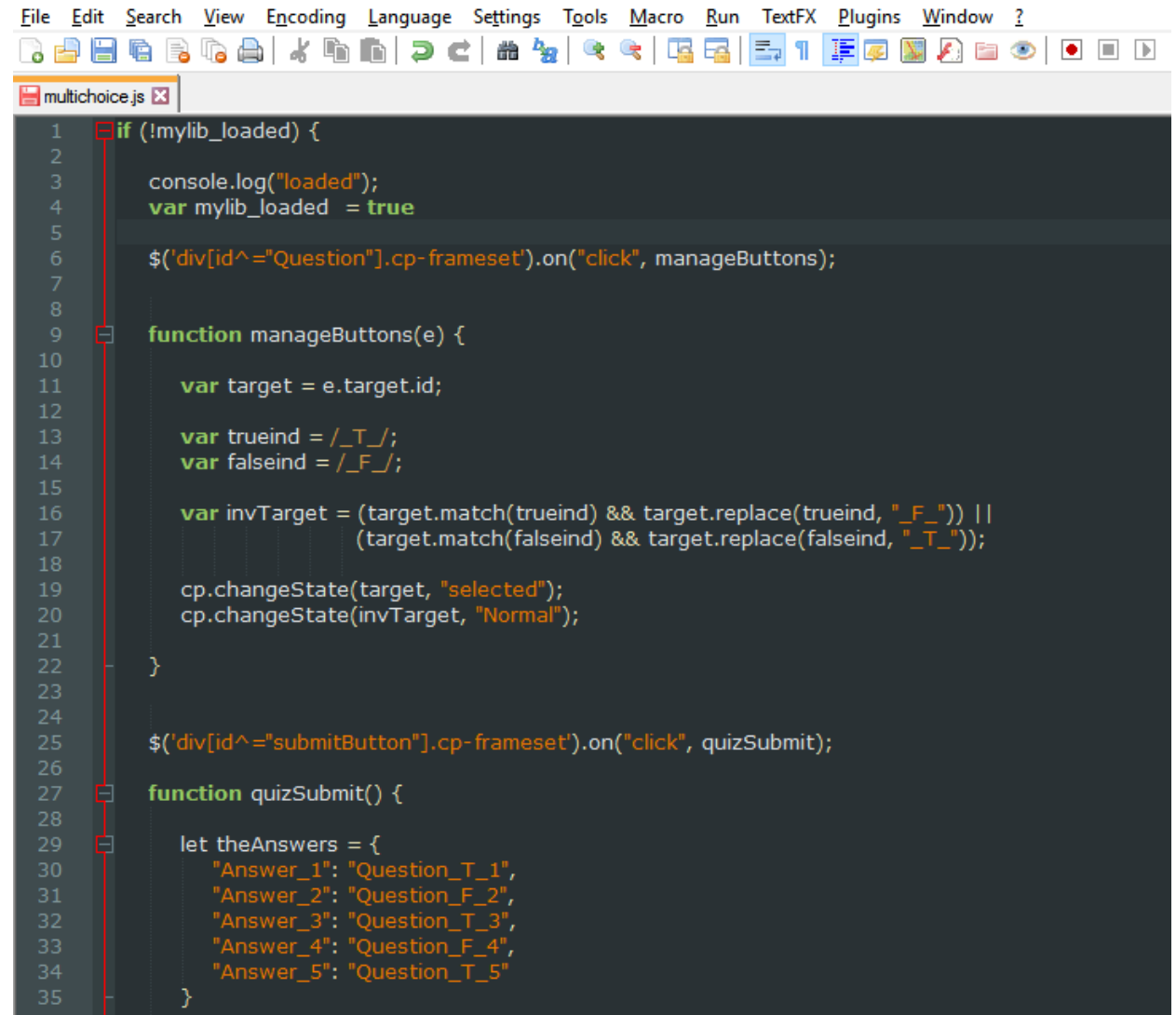
- Changes in this file will be loaded whenever the module is viewed, no need to re-publish course.
- Downside – files “outside” a module are only accessible when using http:// not file://
  - Use local web server
  - Move file inside module

# How to work efficiently with JavaScript

Notepad++ text editor as example

Far easier than built-in script window!

- JavaScript syntax and error highlighting
- Variable name validation
- Multiple windows, spell check etc.

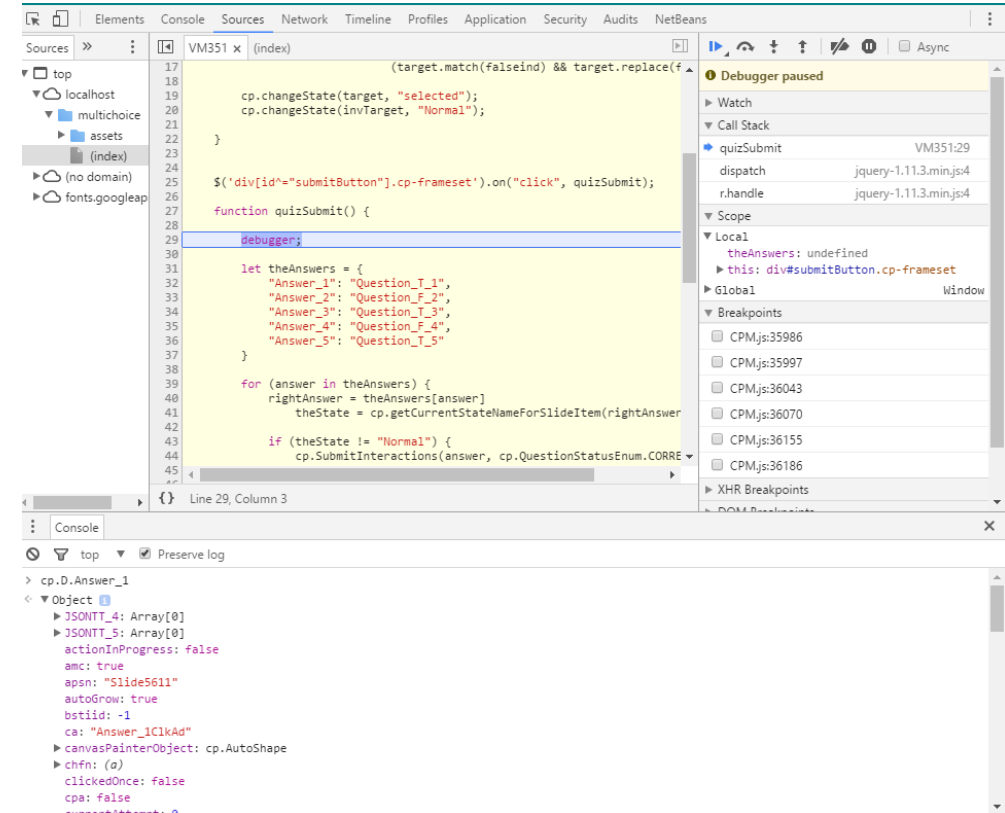
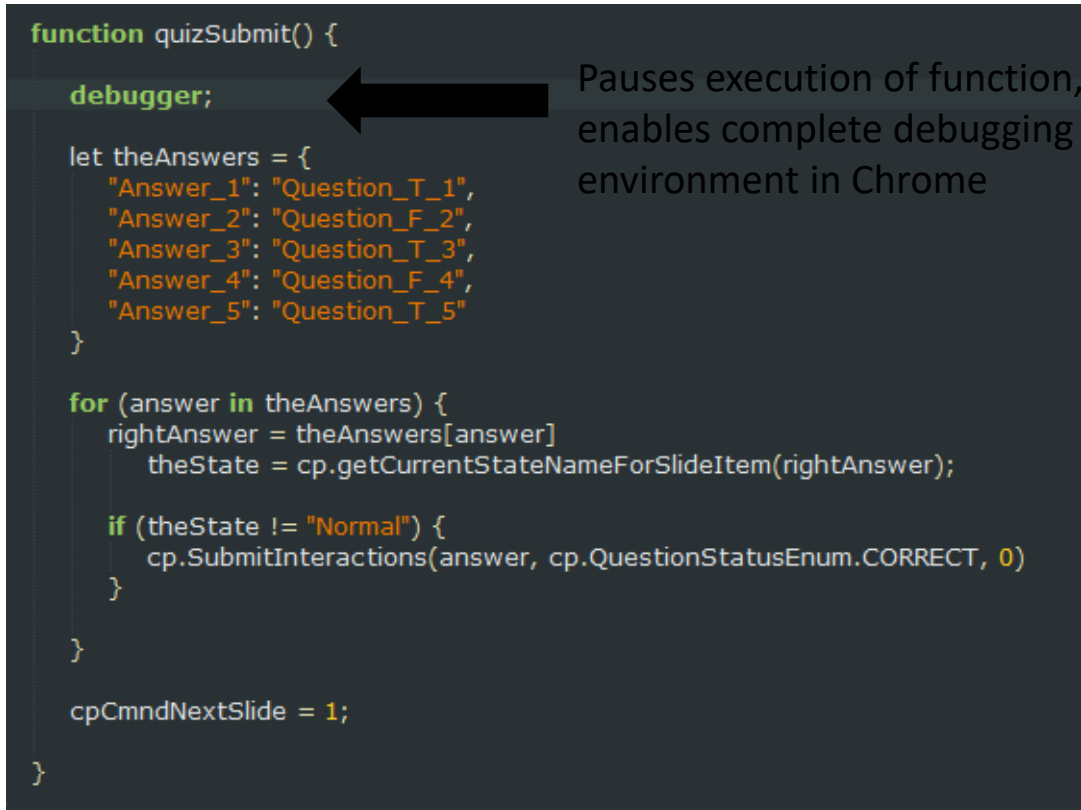


The screenshot shows the Notepad++ text editor interface. The menu bar at the top includes File, Edit, Search, View, Encoding, Language, Settings, Tools, Macro, Run, TextFX, Plugins, and Window. The toolbar below the menu contains various icons for file operations, editing, and development. The main editing area displays a JavaScript file named 'multichoice.js'. The code is as follows:

```
1  if (!mylib_loaded) {
2
3      console.log("loaded");
4      var mylib_loaded = true
5
6      $('div[id^="Question"].cp-frameset').on("click", manageButtons);
7
8
9  function manageButtons(e) {
10
11      var target = e.target.id;
12
13      var trueind = /_T_/;
14      var falseind = /_F_/;
15
16      var invTarget = (target.match(trueind) && target.replace(trueind, "_F_")) ||
17                      (target.match(falseind) && target.replace(falseind, "_T_"));
18
19      cp.changeState(target, "selected");
20      cp.changeState(invTarget, "Normal");
21
22  }
23
24
25  $('div[id^="submitButton"].cp-frameset').on("click", quizSubmit);
26
27  function quizSubmit() {
28
29      let theAnswers = {
30          "Answer_1": "Question_T_1",
31          "Answer_2": "Question_F_2",
32          "Answer_3": "Question_T_3",
33          "Answer_4": "Question_F_4",
34          "Answer_5": "Question_T_5"
35      }
```

# Debugging JavaScript with chrome

F12 opens Chrome debugger!



Step-by-step debugging – unlike advanced actions

# Example – Custom Quiz interaction

<https://github.com/sdwarwick/captivate-demos>

## Rules:

- No scoring until “Submit” is pressed
- True/false toggles correctly
- Score for each answer may be different
- +25 points for 4/5 right answers
- +50 points for 5/5 right answers

## Strategy:

All of the user interactions managed by JavaScript

Quiz will be scored and submitted by JavaScript

	T	F
<i>Mares eat oats</i>	<input checked="" type="radio"/>	<input type="radio"/>
<i>Cow's have hiccups</i>	<input type="radio"/>	<input checked="" type="radio"/>
<i>Does eat oats</i>	<input checked="" type="radio"/>	<input type="radio"/>
<i>Birds snore</i>	<input type="radio"/>	<input checked="" type="radio"/>
<i>Little lambs eat ivy</i>	<input checked="" type="radio"/>	<input type="radio"/>

Submit

# Example – Custom Quiz interaction

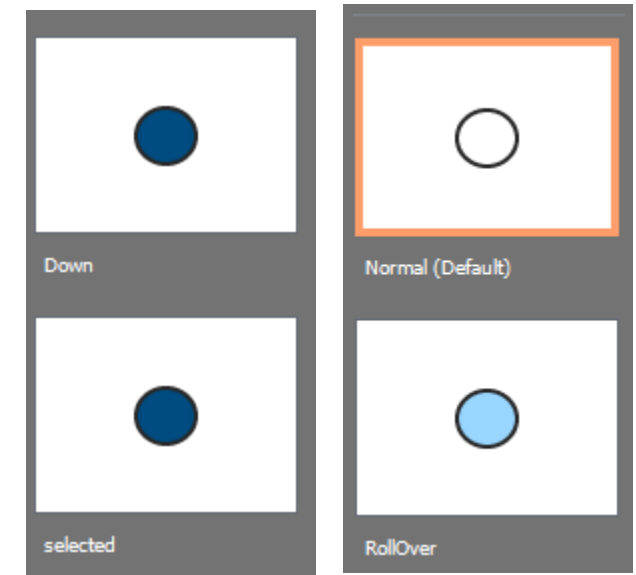
- Slide “on enter execute JavaScript”:

```
$('#body').append('<script src="../multichoice.js" async="false"></script>');
```

```
var fontLink = '<link href="https://fonts.googleapis.com/css?family=Calligraffiti" rel="stylesheet">';  
$(fontLink).appendTo("head");
```

- All buttons are simple circle smartshapes with “use as button”

- Add an additional state called “selected”
- This will be controlled by JavaScript



# Example – Custom Quiz interaction

- The shapes are labeled using a regular pattern that will be easily distinguished in the JavaScript Code
- The hidden answer buttons are all set to “Include in Quiz” and points can be assigned to each answer
- Add variables to enable connection between JavaScript and Captivate
- That’s it.. no advanced actions

				Hidden answer Button ID	Hidden answer Button Quiz Point Value
<input type="radio"/>	<input type="radio"/>	Question_T_1	Question_F_1	<input type="radio"/> Answer_1	10
<input type="radio"/>	<input type="radio"/>	Question_T_2	Question_F_2	<input type="radio"/> Answer_2	10
<input type="radio"/>	<input type="radio"/>	Question_T_3	Question_F_3	<input type="radio"/> Answer_3	10
<input type="radio"/>	<input type="radio"/>	Question_T_4	Question_F_4	<input type="radio"/> Answer_4	10
<input type="radio"/>	<input type="radio"/>	Question_T_5	Question_F_5	<input type="radio"/> Answer_5	10
				<input type="radio"/> Bonus_25	25
				<input type="radio"/> Bonus_50	25

submitButton

```
baseMaxScore
baseScore
bonusMaxScore
bonusScore
cpQuizInfoStudentID
cpQuizInfoStudentName
numberOfQuestions
numberOfRightAnswers
```



# Example Custom Quiz interaction - Toggle

```
$('#div[id^="Question"].cp-frameset').on("click", manageToggleButtons);

function manageToggleButtons(clickedButtonObject) {

    // get shpe id of the clicked button, this will be "selected"
    var targetID = clickedButtonObject.target.id;

    // create the name of the button you need to toggle to "unselected"
    if ( targetID.match(/_T_/) ) {
        var invTargetID = targetID.replace(/_T_/, "_F_")
    }

    if ( targetID.match(/_F_/) ) {
        invTargetID = targetID.replace(/_F_/, "_T_")
    }

    // captivate undocumented function to change state of object
    cp.changeState(targetID, "selected");
    cp.changeState(invTargetID, "Normal");
}
```

Find all buttons that start with the word "Question". When clicked, call "manageToggleButtons function"

Take the name of the button that was pressed, changes any "\_T\_" to "\_F\_" and any "\_F\_" to "\_T\_"

Call an undocumented captivate function "cp.changeState" to toggle between the "Normal" view and the "selected" view

Over the years, many people have contributed to weeding through the CPM.js code to find these functions

# Example Custom Quiz interaction - Scoring

```
$('#div[id^="submitButton"].cp-frameset').on("click", quizSubmit);

function quizSubmit() {

    //debugger;

    // these are defined in captivate and used in analysis
    numberOfRightAnswers = 0;
    numberOfQuestions = 0;
    baseScore = 0;
    baseMaxScore = 0;
    bonusScore = 0;
    bonusMaxScore = 0;

    // the right answer button is selected, signal this internal button
    var theRightAnswers = {
        "Question_T_1" : "Answer_1",
        "Question_F_2" : "Answer_2",
        "Question_T_3" : "Answer_3",
        "Question_F_4" : "Answer_4",
        "Question_T_5" : "Answer_5"
    }
}
```

- The first line triggers the quiz submit function for the button with the ID “submitButton”
- Variables defined in captivate can be directly used in JavaScript!
- The correct answers are defined by which of the question buttons were set to state “selected”
- If the correct answer is selected, which hidden button should be activated?

# Example Custom Quiz interaction - Scoring

```
// the right answer button is selected, signal this internal button
var theRightAnswers = {
  "Question_T_1" : "Answer_1",
  "Question_F_2" : "Answer_2",
  "Question_T_3" : "Answer_3",
  "Question_F_4" : "Answer_4",
  "Question_T_5" : "Answer_5"
}

//check each of the right answer button for state, if selected, signal to captivate
for (rightAnswerButton in theRightAnswers) {

  numberOfQuestions = numberOfQuestions + 1;
  rightAnswerSenderButton = theRightAnswers[rightAnswerButton];

  // get quiz value for this answer - this is obscure but works
  answerObjectID = cp.D[rightAnswerSenderButton].qnq;
  answerValue = cp.D[rightAnswerSenderButton + "q" + answerObjectID].w;

  //add to max base score
  baseMaxScore = baseMaxScore + answerValue;

  theState = cp.getCurrentStateNameForSlideItem(rightAnswerButton);

  if (theState == "selected") {
    // undocumented function for signalling to a quiz button
    cp.SubmitInteractions(rightAnswerSenderButton, cp.QuestionStatusEnum.CORRECT, 0)
    numberOfRightAnswers = numberOfRightAnswers + 1;
    baseScore = baseScore + answerValue;
  }
}
```

When writing code, try to keep things flexible..

- Determine maximum number of questions, maximum score, answered questions and score values on the fly
- Here's how to get the value of a quiz button
- Here's how to find the state of a slide object
- If the right button was selected then we call another undocumented function that signals to captivate that an answer was given correctly.

# Example Custom Quiz interaction - Scoring

```
// add bonuses
rightAnswerSenderButton = "Bonus_25"
answerObjectID = cp.D[rightAnswerSenderButton].qnq;
answerValue = cp.D[rightAnswerSenderButton + "q" + answerObjectID].w;
bonusMaxScore = bonusMaxScore + answerValue;

if (numberOfRightAnswers >= 4) {
    cp.SubmitInteractions(rightAnswerSenderButton,
        cp.QuestionStatusEnum.CORRECT, 0);
    bonusScore = bonusScore + answerValue;
}

rightAnswerSenderButton = "Bonus_50"
answerObjectID = cp.D[rightAnswerSenderButton].qnq;
answerValue = cp.D[rightAnswerSenderButton + "q" + answerObjectID].w;
bonusMaxScore = bonusMaxScore + answerValue;

if (numberOfRightAnswers == 5) {
    cp.SubmitInteractions(rightAnswerSenderButton,
        cp.QuestionStatusEnum.CORRECT, 0);
    bonusScore = bonusScore + answerValue;
}

cpCmndNextSlide = 1;
```

Find quiz value for the bonus points by looking at the Captivate data

Award points based on some criteria - here it is at least 4 answers right

Here it is 5 answers right...

After done, signal to move to next slide by simply setting the "next slide" flag variable

# Example – Custom Quiz interaction

## Why is this example important?

- Other than labeling the buttons, setting question values and loading the external JavaScript module, no advanced actions or special processing is needed
- The scoring is completely general. Any set of button presses can be used to generate a specific quiz result
- Scoring doesn't happen for any of the quizzing until the interaction is complete
- Custom interactions need not be limited to one “slide”
- Although not shown, at any point in the process, additional information can be given to the user
- Other measures can be made along the way:
  - How many times has the user changed their score?
  - How long did it take before the user completed the quiz?

# Example – “Full screen” mode

- Any button that has a name starting in “fullscreen” will activate this code
- Also works for presentations embedded in other applications (IFRAME)

```
function fullScreenButton() {  
  let j = $('[id^="fullscreen"]').on('click', function (e) {  
    let i = parent.document.getElementsByTagName("iframe")[0]  
    if (i == null) {  
      i = document.getElementById("main_container")  
    }  
    i.requestFullscreen && i.requestFullscreen();  
    i.webkitRequestFullscreen && i.webkitRequestFullscreen();  
    i.mozRequestFullscreen && i.mozRequestFullscreen();  
    i.msRequestFullscreen && i.msRequestFullscreen();  
  });  
};
```

```
function cancelFullScreenButton() {  
  let j = $('[id^="stdscreen"]').on('click', function (e) {  
    let i = parent.document;  
    if (i == null) {  
      i = document.getElementById("main_container")  
    }  
    i.cancelFullscreen && i.cancelFullscreen();  
    i.webkitCancelFullscreen && i.webkitCancelFullscreen();  
    i.mozCancelFullscreen && i.mozCancelFullscreen();  
    i.exitFullscreen && i.exitFullscreen();  
  });  
};
```

```
fullScreenButton();  
cancelFullScreenButton();
```

# Example – Drag and drop

<https://github.com/sdwarwick/captivate-demos>

## Build an Effective Quality Improvement Team

Build your perfect QI Team by pulling members into the lobby!

Highest score balances size of team with diversity and relevance of skills

IT Representative	Chief Medical Officer
Resident MD, CICU	MD, Infectious Disease
Housekeeping Supervisor	Budget Office Staff
HR Supervisor	RN, CICU Supervisor
Laboratory Support	Clerk/Scheduler
RN Infection Prevention	Pharmacist
Social Worker	Quality Improvement Lead
RN, CICU	Patient



Team Size Score  
0

+

Skill Diversity Score  
0

=

Total Score (Max. 1000)  
0



Start Over

Submit



# Example – Drag and drop

<https://github.com/sdwarwick/captivate-demos>

**Build an Effective Quality Improvement Team**

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Housekeeping Supervisor	Budget Office Staff
HR Supervisor	RN, CICU Supervisor
Laboratory Support	Clerk/Scheduler
RN Inf	ist
S	ne



Team Size Score: 0 + Skill Diversity Score: 0 = Total Score (Max. 1000): 0

Start Over Submit



# Example – Drag and drop

<https://github.com/sdwarwick/captivate-demos>

“team”  
Drop Target

★ pool_shape
★ qil
★ rnSup
★ Patient
★ budget
★ pharm
★ MDdisease
★ clerk
★ CMO
★ rncicu
★ RNInfect
★ SocialW
★ HKSUP
★ Lab
★ resMD
★ hrSup
★ IT

“candidates”  
Source Pool

All scoring functions in JavaScript  
Each time a “candidate” is dropped, “game1drop()” is called

“team”  
Object Actions

Accepted Drag Sources

☒ Accept All    Count: -1    On Accept : ☐ Replace    **JavaScript**

<input checked="" type="checkbox"/>	Drag Source Type	Action
<input checked="" type="checkbox"/>	candidates	Execute JavaScript

game1drop()

“team” correct  
Answer pool

No.	Drop Target	Drag Source	Count
1	team	candidates	16

# Example – Drag and drop

<https://github.com/sdwarwick/captivate-demos>

```
// a call to this is added to interaction in drop target
function game1drop() {
    let iact = cp.DD.CurrInteractionManager.getActiveInteraction();
    current_target = iact.m_DsFrameSetDataID;

    team_count += 1;
    team_score = team_points[team_count];

    skill_score += knowledge_points[current_target];
    total_score = skill_score + team_score;

    setCss();
}
```

Let JavaScript figure out what source item was moved

Create scoring based on some criteria

- count of dragged components
- value score for team member

Give feedback by changing colors of shapes directly using CSS on shapes

# Undocumented Captivate functions and data structures..

## The CPM.js library

- 25,000 JavaScript statements in the basic library to “run” a presentation
- 100,000+ statements to define all objects in a large presentation

## CPM.js defines 100+ “top level objects/properties”

CP top object - defines 751 objects/properties

CP.D - all of the slide objects and quizzing information

CP.DD - drag/drop interaction data

CP.em - event manger

CP.movie – timing manager

## Lots of other things, too much to even begin to describe..

- Animation
- Display timing
- Quiz handling
- Drag/Drop interactions
- LMS Reporting system..

CPM.js code is well organized with very descriptive top level function names

# Undocumented Captivate functions and data structures Used in these two examples

cp.changeState(targetID, state)  
cp.getCurrentStateNameForSlideItem(targetID);  
cp.show(targetID) , cp.hide(targetID)  
cp.D[targetID].qnq (find question data for targetID)  
cp.D[questionID].w (question score value – can read and write!)  
cp.SubmitInteractions(targetID, cp.QuestionStatusEnum.CORRECT, 0) (click answer button!)

cp.DD.CurrInteractionManager.getActiveInteraction() (get activeDDInteraction)  
activeDDInteraction.m\_DsFrameSetDataID; (id of last dropped target)  
ActiveDDInteraction.OnResetButtonClicked(); (click DD reset button)  
activeDDInteraction.undoAvailable (check if undo is available)  
activeDDInteraction.OnUndoButtonClicked();  
activeDDInteraction.OnSubmitButtonClicked();

cp.RuntimeMessageBox(document.getElementById("cpDocument"), 1) (create a new message box)

# Far too much to “figure out” in CPM.js

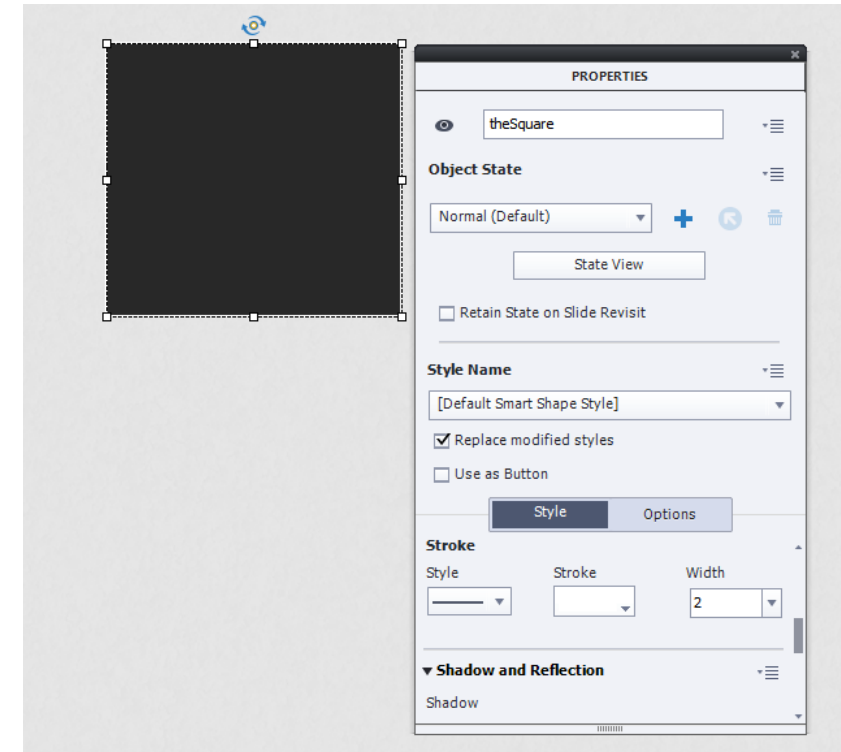
What is an efficient custom interaction development strategy?

- Build basic shapes and simple interactions that do not require advanced actions directly in Captivate
- Use Adobe Documented JavaScript library as starting place
- Developers familiar with HTML/CSS/JAVASCRIPT:
  - Build custom interactions decoupled from the Captivate data structures as much as possible
  - Bridge back into Captivate using the CPM.js library functions
  - Leverage undocumented features only as needed

# JavaScript to Captivate bridge

- All shape information is found in the object CP.D
  - cp.D.shapename
  - cp.D.shapename`c`
  - cp.D.shapename`q0`
- Shape name is used as a base to build HTML

```
<div id=theSquare>
<canvas id=theSquarec>
<div id=theSquare_vTxtHolder>
<div id=re-theSquarec>
<div id=theSquare_vTxtHandlerHolder>
<div id=theSquareaccStr>
```
- Use these objects to create custom effects



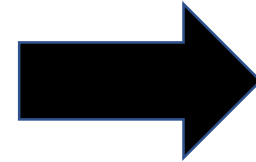
# JavaScript to Captivate bridge

- All variables in captivate are now global JavaScript variables  
Example: `cpInfoCurrentSlide ==`  
`cpAPIInterface.getVariableValue("cpInfoCurrentSlide")`
- Event-driven JavaScript functions ( mouse clicks.. )
  - Indirect: use actions and scripts in captivate (captivate dependency)
  - Direct: use JavaScript events tied directly to HTML objects (JavaScript only)
- Captivate monitors all variable values once every frame ( 1/30 sec )
  - Simply setting timing-control variables to “true” will cause changes in state
  - Example: `cpCmdNextSlide = 1`
- Quiz management has another data structure, too much to describe here

# Notepad++ JavaScript formatter

Convert compressed CPM.js to readable code  
Save formatted version back into project

## Enables modification & debugging

[illegible]

```

1  if (!window.cp)
2      window.cp = function (str) {
3          return document.getElementById(str)
4      };
5  cp.CPPProjInit = function () {
6      if (cp && cp.model && cp.model.data)
7          return;
8      cp.model = {};
9      cp.poolResources = {};
10     cp.D = cp.model.data = {
11         pref: {
12             acc: 1,
13             rkt: 0,
14             hsr: 1
15         },
16         SmartShape_9: {
17             type: 612,
18             from: 1,
19             to: 90,
20             rp: 0,
21             rpa: 0,
22             mdi: 'SmartShape_9c',
23             retainState: false,
24             immo: false,
25             apsn: 'Slide5611',
26             JSONTT_4: [],
27             cpa: true,
28             oca: 'cp.jumpToNextSlide();',
29             JSONTT_5: [],
30             ofa: 'cp.CmdndResume = 1;',
31             vt: '<div><div style="margin-left:0px;display:block;text-align:center">T</span></span><span class="cp-actualText" style="font-size: 1.2em">T</span></div>',
32             rplm: {
33                 414: 0,
34                 667: 0,
35                 768: 0,
36                 896: 0,
37                 1024: 0
38             },
39             rprm: {
40                 414: 0,
41                 667: 0,
42                 768: 0,
43                 896: 0,
44                 1024: 0
45             }
46         }
47     }
48 }

```



# 105 “top level” variables generated by CPM.js

## cp

cpXHRJSLoader  
cpAPIInterface  
cpAPIEventEmitter  
cpCmndVolume  
cpCmndMute  
cpCmndCC  
cpCmndNext  
cpCmndNextSlide  
cpCmndPrevious  
cpCmndNextOnReview  
cpCmndPreviousSlide  
cpCmndPreviousOnReview  
cpCmndPlaybarMoved  
cpCmndShowPlaybar  
cpCmndFastForward  
cpCmndRewindAndPlay  
cpCmndRewindAndStop  
cpCmndGotoFrame  
cpCmndGotoFrameAndResume  
cpCmndGotoSlide  
cpCmndGotoSlideAndResume  
cpCmndGotoSlideByUIDAndResume  
cpCmndResume  
cpCmndPause  
cpCmndExit  
cpLockTOC  
cpCmndInfo

cpCmndTOCVisible  
cpInfoSlidesInProject  
cpInfoFPS  
cpInfoAuthor  
cpInfoCompany  
cpInfoEmail  
cpInfoWebsite  
cpInfoCopyright  
cpInfoProjectName  
cpInfoDescription  
cpInfoCurrentFrame  
\_cpInfoCurrentFrame  
cpInfoPrevFrame  
cpInfoFrameCount  
cpInfoPrevSlide  
\_cpInfoPrevSlide  
cpInfoLastVisitedSlide  
\_cpInfoLastVisitedSlide  
cpInfoCurrentSlide  
cpInfoCurrentSlideIndex  
\_cpInfoCurrentSlide  
cpInfoCurrentSlideLabel  
\_cpInfoCurrentSlideLabel  
cpInfoSlideCount  
cpInfoIsStandalone  
cpInfoHasPlaybar  
cpInfoCurrentSlideType  
cpInfoIsResultSlide  
cpInfoElapsedTimeMS

cpInfoEpochMS  
cpInfoCurrentMinutes  
cpInfoCurrentHour  
cpInfoCurrentTime  
cpInfoCurrentDay  
cpInfoCurrentYear  
cpInfoCurrentMonth  
cpInfoCurrentDate  
cpInfoCurrentDateString  
cpInfoCurrentDateStringDDMMYYYY  
cpCmndGotoQuizScopeSlide  
cpQuizInfoLastSlidePointScored  
cpQuizInfoQuestionSlideType  
cpQuizInfoAnswerChoice  
cpQuizInfoMaxAttemptsOnCurrentQuestion  
cpQuizInfoPointsPerQuestionSlide  
cpQuizInfoNegativePointsOnCurrentQuestionSlide  
cpQuizInfoQuestionSlideTiming  
cpQuizInfoQuizPassPoints  
cpQuizInfoQuizPassPercent  
cpQuizInfoTotalProjectPoints  
cpQuizInfoTotalUnansweredQuestions  
cpQuizInfoNoQuestionsPerQuiz  
cpQuizInfoPointsscored  
cpQuizInfoPretestPointsscored  
cpQuizInfoPretestScorePercentage

cpQuizInfoTotalCorrectAnswers  
cpInfoPercentage  
cpQuizInfoTotalQuizPoints  
cpQuizInfoAttempts  
cpQuizInfoTotalQuestionsPerProject  
cpQuizInfoQuestionPartialScoreOn  
cpQuizScopeSlide  
cpInQuizScope  
cpQuizInfoPassFail  
cpInfoCourseID  
cpInfoCourseName  
cpQuizInfoPreTestTotalCorrectAnswers  
cpInReviewMode  
cpQuizInfoPreTestTotalQuestions  
cpQuizInfoPreTestMaxScore  
cpInfoMobileOS  
cpQuizInfoStudentID  
cpQuizInfoStudentName  
cpQuizHandledAll

# What else does JavaScript open up?

- References to external content – fonts, libraries
- Real-time, group interactions with backend data sources (AJAX)
- Video game-level animations
- Dynamic Graphing and Charting
- Fine-grained experience measurement
- Pass information between parent/child windows
- Custom reporting to LMS/LRS
- Access to the entire web development community!

# Questions?