WANT RELIABLE METRICS FOR YOUR ORGANIZATION? USE PROTOTYPING!

Deborah L. Stone, CPT
President & CEO

Steven W. Villachica, Ph.D., CPT
Chief Learning Officer

www.dls.com

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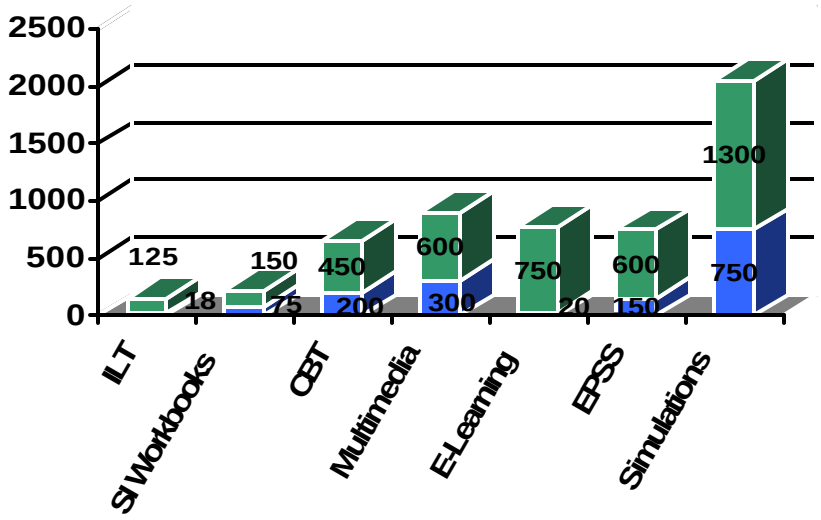
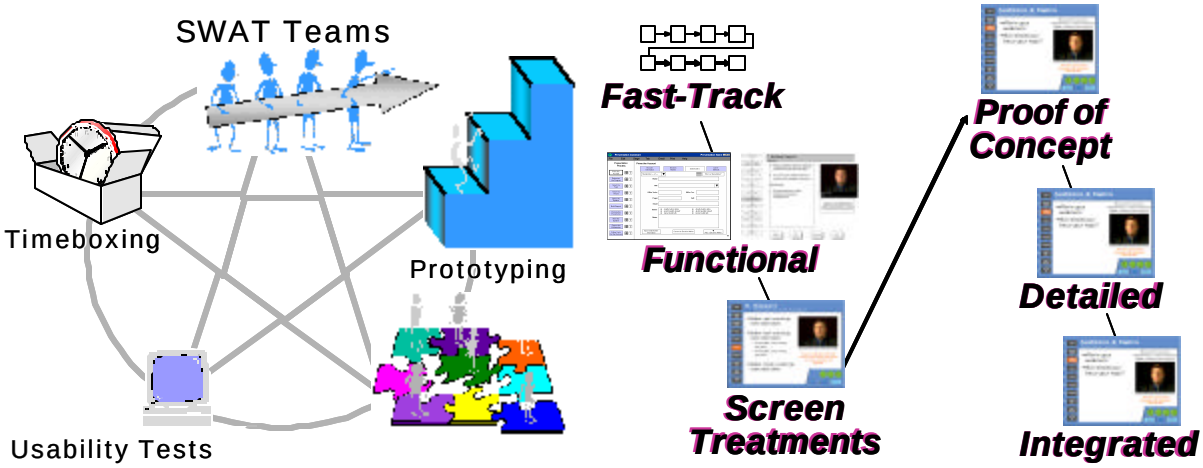
Development Ratios Vary Widely

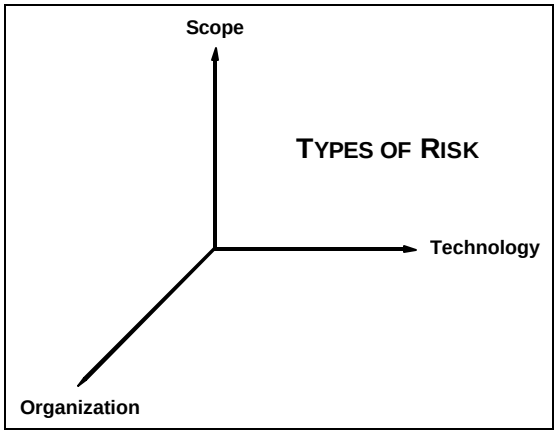


Rapid Application Development and Prototyping



Appendices

FACTORS THAT AFFECT DEVELOPMENT RATIOS



Organizational Factors

- Span of control and level of project sponsor.
- Dedication and relationship of client and supplier project managers.
- Quality of product (from both the customer's and supplier's perspective).
- Number of reviews and timelines for sign-off.
- Previous experience with the customer.
- Amount of end-user involvement in analysis, design, and implementation.
- Amount of available expertise in the subject matter.
- Quality of communications.
- Presence of hidden agendas.
- Expected amount of time spent not related to designing or revising the instructional materials. Some developers estimate that this typically consumes about 80 percent of project time.

Scope Factors

- Number of expected user contact hours.
- Cognitive performance requirements (conceptual, procedural, problem-solving).
- Complexity of content.
- Number, type, and complexity of components.
- Availability, quality, and accuracy of existing content.
- Complexity and frequency of interactions (performance requirements).
- Specificity of the performance requirements.
- Number and complexity of graphics, animation, and multimedia.
- Ease of use.
- Familiarity of target audience with medium.
- Quality of finished product requirements.
- Length of course.
- Degree of remediation (e.g., quizzes, selective module reviews).

Technology Factors

- Development and implementation platform, authoring and architecture / network environment.
- Distribution.
- Available bandwidth.
- Familiarity with development approach.
- Availability and expertise in specialized development tools, libraries, and templates.
- Experience of development team.
- Degree to which development team has worked together before.
- Rigor of the project management and change management processes.
- Development model the project team employs (traditional ADDIE's linear, "waterfall" approach versus Rapid Application Development (RAD) or other 4th generation ISD model).
- Availability of project management data describing a similar development effort.
- Availability of appropriate templates or toolsets.
- Need for specialized peripherals (e.g., touch screens, digitizers, robotics).

PROTOTYPING FACTOIDS

- Organizations within the United States have increased their use of prototyping from approximately 30 percent in the early 1980s to 60 percent in the early 1990s. (Hardgrave and Wilson, 1994)
- Gordon and Bieman (1995) cite individual cases where prototyping reduced software development efforts by 45 percent and 70 percent.
- Bernstein and Appel cite an approximate 40 percent reduction in software development effort associated with prototyping.
- Martin (1983) reports that productivity improvements of more than 1,000 percent are not uncommon when using prototyping.
- A software revision requiring $1 to make during the analysis phase could cost between $1.50 - $6.00 to make during development and between $60-$100 to make after release. (Pressman, 1992)
- Pressman (1982) estimates that 80 percent of total software life-cycle costs occur during maintenance. Of these maintenance costs, Martin and McClure (1983) attribute 80 percent of them to unmet or unforeseen user requirements and 20 percent to bugs or reliability problems.
- Dissatisfied software end users often become "project terrorists" and will tell an average of 16 other people about his or her problems with a system. In contrast, each satisfied user will tell only eight people (Merlyn, 1995).
- Prototyping reportedly reduced one plastic manufacturer's development cycle by 60 percent. (Griffiths, 1993).

PROTOTYPING PROCESS

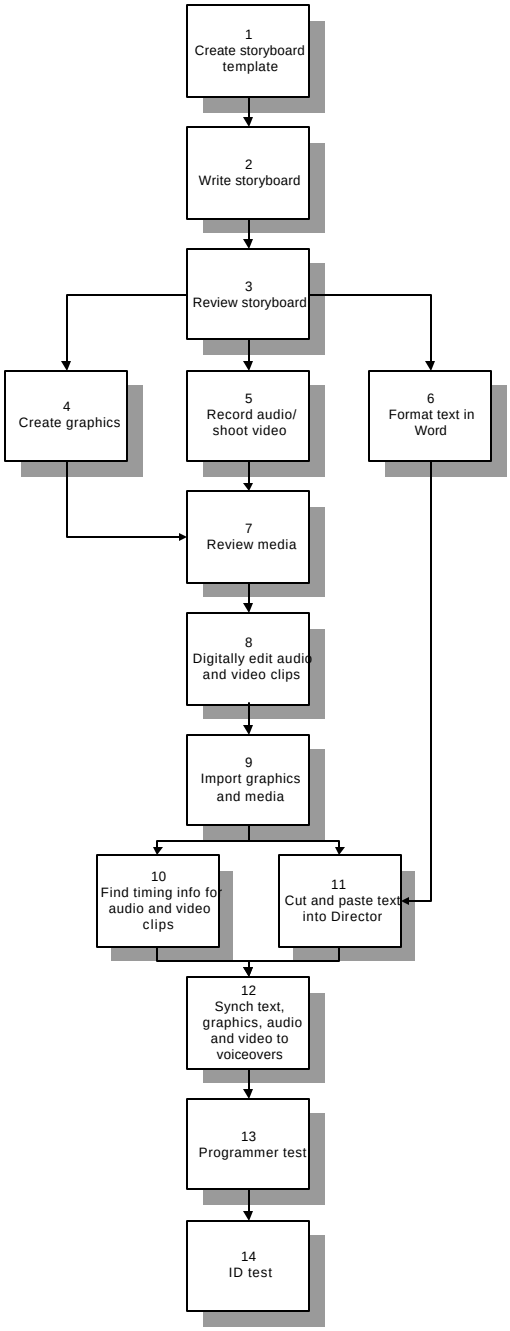
Phases	Input	Process	Decisions	Responsibility	Output
1. Fast-track scenario	• Performance requirements from Joint Requirement Planning (JRP) Workshop	• Convert performance requirements into a fast-track scenario • Draw the screens comprising the fast track on a whiteboard • Client review	• How will users interact with the intervention? • What screens do we need to represent these interactions? • Is the fast-track scenario consistent with the performance requirements? • Do the performance requirements need to be modified for accuracy and completeness?	• Programmer • Lead HPT • SME • Graphic artist	• Approved fast-track scenario
2. Functional Prototype	• Fast-track scenario • Performance requirements from Joint Requirement Planning (JRP) Workshop	• Create PowerPoint prototype • Client review	• Does the functional prototype meet the specified performance requirements? • Do the performance requirements need to be modified for accuracy and completeness?	• Lead HPT	• Approved functional prototype

Phases	Input	Process	Decisions	Responsibility	Output
3. Screen Treatments	• Approved functional prototype • Client identity materials	• Create Adobe Photoshop & Illustrator depictions of the main screens • Client review	• What should the user interface look like? • What graphic combinations will provide the best look and feel? • Do the screen treatments meet the performance requirements? • Do the performance requirements need to be modified for accuracy and completeness?	• Graphic artist • Lead HPT	• Approved screen treatments

Phases	Input	Process	Decisions	Responsibility	Output
4. Prototype Proof of Concept (broad and shallow)	• Functional prototype • Screen treatments	• Assemble graphics and text in software programming tool • Client review	• Do you build an evolutionary or throwaway prototype? • Is the user interface attractive? • Should the prototype be linear, non-linear or a mix? • Does the prototype meet the performance requirements? • Do the performance requirements need to be modified for accuracy and completeness?	• Programmer • Graphic artist • Lead HPT	• Approved proof of concept prototype
5. Detailed Prototype (narrow and deep)	• Proof of concept prototype	• Code detailed representative functionalities • Client review	• What additional functionality should the prototype illustrate in detail? • Does the prototype meet the performance requirements? • Do the performance requirements need to be modified for accuracy and completeness?	• Programmer • Lead HPT • Graphic artist	• Approved detailed prototype

Phases	Input	Process	Decisions	Responsibility	Output
6. Integrated Prototype	• Detailed Prototype	• Transfer programming from prototyping language to operational language • Client review	• Does the integrated prototype work as expected? • Does the prototype meet the performance requirements? • Do the performance requirements need to be modified for accuracy and completeness?	• Programmer • Lead HPT • Project Manager	• Approved integrated prototype

PROJECT METRIC SPREADSHEET CASE STUDY



Activities	Description	Responsibility	Inputs	Output	Estimated Proto Time	Actual Proto Time	Variance	Estimated Dev Time	Actual Dev Time	Variance
1. Create storyboard template	Design a model for conveying program content to the program with minimal ambiguity	Senior ID	Program requirements / outline	Storyboard template	2	2	0	0	0	0
2. Write storyboard	Enter content into template.	ID	Outline	Storyboard	3	8	-5	40	32	8
3. Review Storyboard	Ensure that content in storyboards is clear to programmer, instructionally effective, and does not introduce new functionalities.	Sr. ID, ID, and Programmer	Storyboards	Suggested revisions	4	6	-2	6	2	4
4. Create graphics	Develop the graphic files specified in storyboard.	Graphic artist	Storyboards	Graphic files	20	20	0	50	40	10
5. Record audio / shoot video	Develop the audio and video files specified in storyboard.	Multimedia specialist	Storyboards	Audio files	8	8	0	0	0	0

Activities	Description	Responsibility	Inputs	Output	Estimated Proto Time	Actual Proto Time	Variance	Estimated Dev Time	Actual Dev Time	Variance
6. Format text in Word	Apply fonts, styles, formatting to prepare text for direct cutting and pasting into Director.	ID / Admin	Unformatted text	Formatted text	0	0	0	4	4	0
7. Review media	Ensure that audio, video and graphics are importable and high quality.	Programmer	Media	Usable media	2	4	-2	0	0	0
8. Digitally edit video and audio clips	Remove "um's," "ah's" and unnecessary pauses to create more engaging video sequences.	Multimedia specialist	Video and audio	Edited video and audio	2	3	-1	12	9	3
9. Import and align graphics & media	Bring audio, video and graphic files into Director cast and assemble media on stage.	Programmer	Media files	Cast members	12	16	-4	70	50	20
10. Find timing info. for audio & video clips	Locate the times in each video and audio clip the corresponding text boxes should appear.	Programmer / ID	"soundTime" and "MovieTime" buttons in score	Synched quote boxes	16	16	0	40	34	6

Activities	Description	Responsibility	Inputs	Output	Estimated Proto Time	Actual Proto Time	Variance	Estimated Dev Time	Actual Dev Time	Variance
11. Cut & paste text in Director	Bring Word text objects into Director cast.	ID	Formatted Word text	Director text	0	0	0	4	1	3
12. Synch text, graphics, audio & video to voiceovers (final prototype assembly)	Time the text boxes to appear at the appropriate time as the audio/video are playing.	Programmer	Voiceovers	Finalized section of program	8	8	0	40	32	8
13. Programmer Test	Ensure that the program works from start to finish.	Programmer	Program	Tested Program	2	2	0	12	8	4
14. ID Test	Conduct a detailed review to ensure that items appear at the appropriate time, and that all navigation works as intended.	ID	Program	Tested Program	2	2	0	12	8	4

Summary	Estimated Proto Time	Actual Proto Time	Variance	Estimated Dev Time	Actual Dev Time	Variance
Average time to create one lesson (in hours)	79 hrs.	93 hrs.	+14 hrs.	30.9 hrs.	23.6 hrs.	- 7.3 hrs.

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