

A CONTINUAL IMPROVEMENT PARADIGM FOR MODERN ONLINE TEXTBOOKS

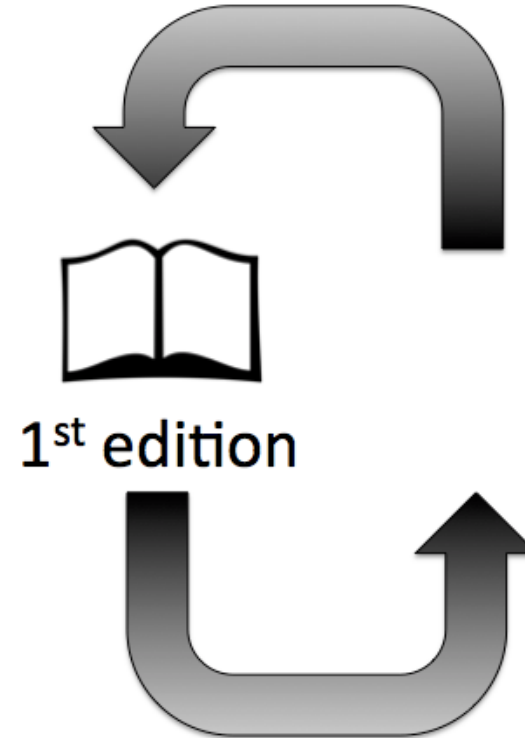
P Participation Activity 5.2.5: HLSM introduction.

Complete the timing diagram.

Inputs: j, k
Outputs: Z(8)
Variable: M(8)

clk	[Clock signal waveform]			
j	[Input signal waveform]			
k	[Input signal waveform]			
State	(a)	t	t	u
M	(b)	(c)	54	54
Z	27	27	27	(d)

#	Question	Your answer
1	(a) ✓ <input type="text" value="s"/> The initial state is graphically indicated by a transition coming from nothing.	<input type="text" value="s"/> Show answer <input type="button" value="Check"/>
2	(b) ✗ The initial state is s, which sets M = ?	<input type="text" value="t"/> Show answer <input type="button" value="Check"/>



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Interactive textbook – Less text

1.9 Equations to/from circuits

An equation is just one way to represent a Boolean function. Another way is using a circuit.

An equation can be converted to a circuit by converting each operation to a gate. Conversion is done first for items within parentheses. NOT is converted before AND or OR.

P Participation Activity 1.9.1: Convert equation to circuit.

Start

$$w = (a + b)cd'$$

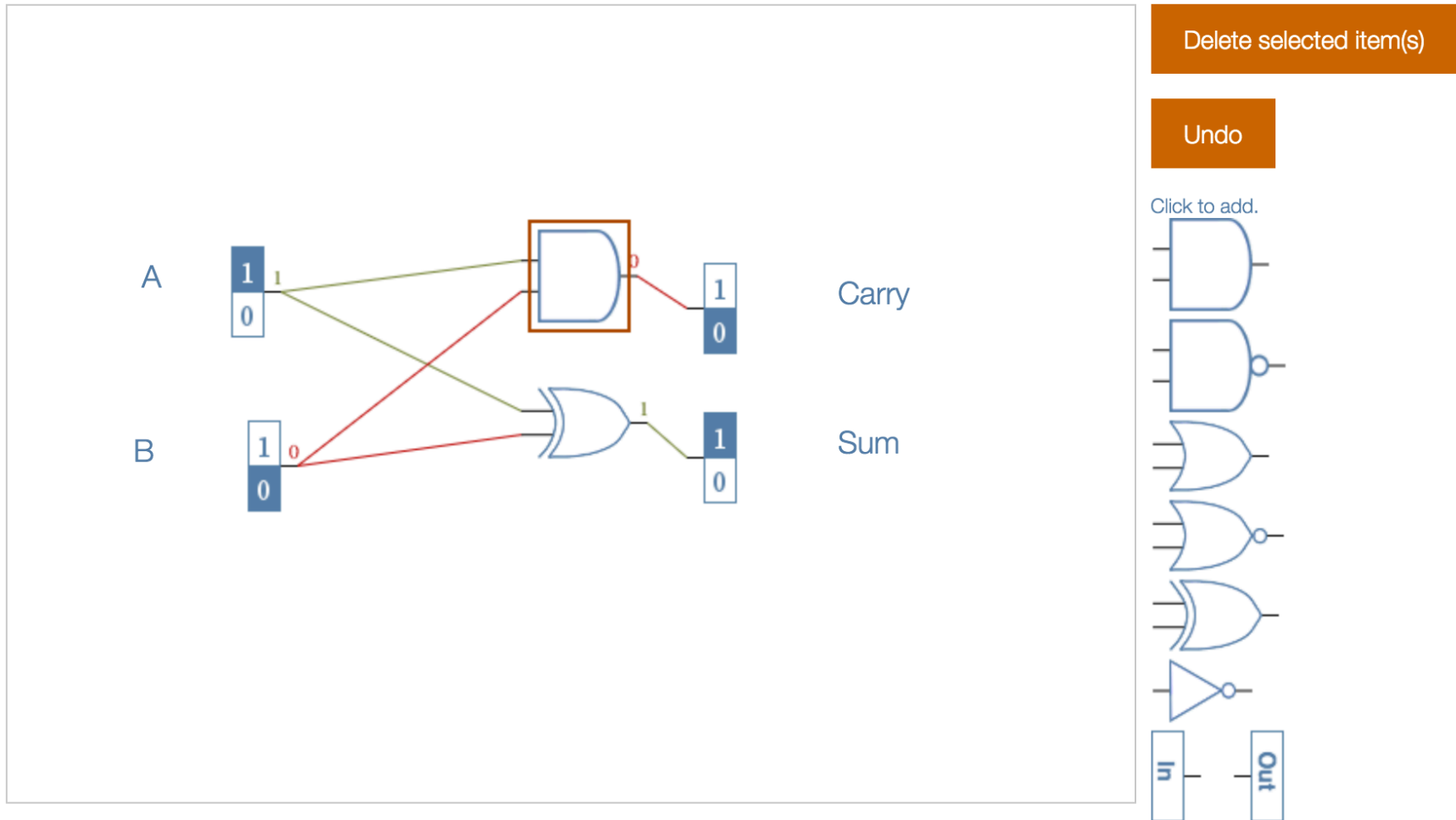
Feedback?

P Participation Activity 1.9.2: Converting an equation to a circuit.

Use the figure above to determine the missing value.
Original equation: $y = ij + mn'$

#	Question	Your answer
1	(a)	AND
		OR
		NOT
2	(b)	m
		n
		mn'
		i
		j
3	(c)	m
		n

Interactive textbook – Simulators



Interactive textbook – Animations

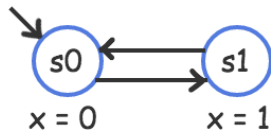


Participation
Activity

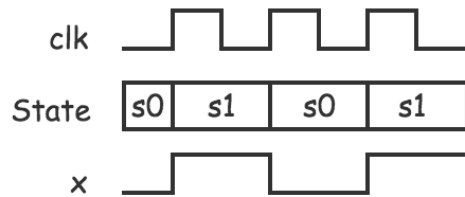
3.4.2: Timing diagrams for FSMs.

- 1 2 3 4 5 6 ▶

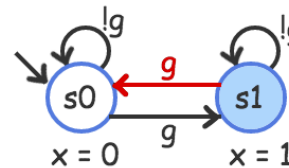
Inputs: none Outputs: x



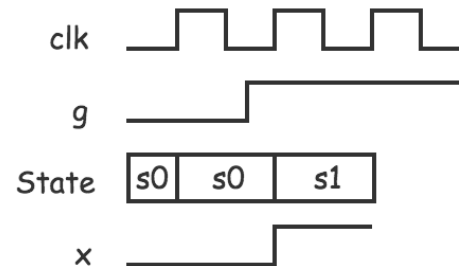
Timing diagram



Inputs: g Outputs: x



Timing diagram



At each rising edge, an FSM changes to a next state pointed to by a transition whose condition evaluates to true (1).

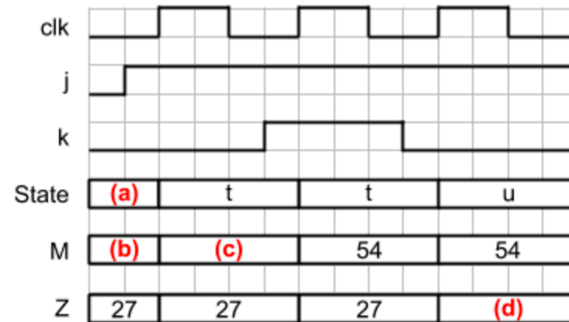
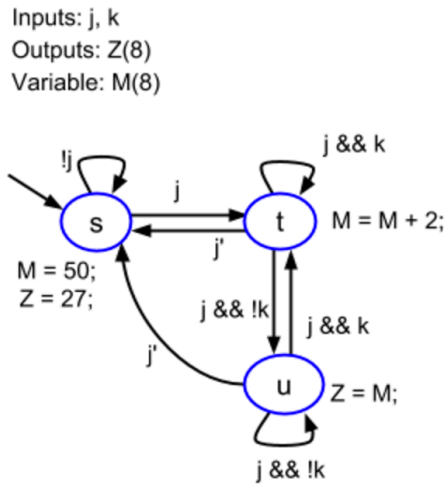
Interactive textbook – Learning questions



Participation Activity

5.2.5: HLSM introduction.

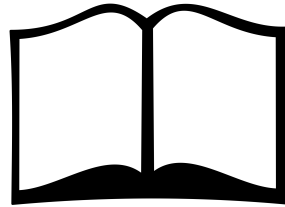
Complete the timing diagram.



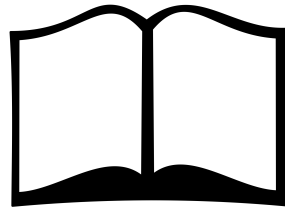
#	Question	Your answer
1	(a) <input checked="" type="checkbox"/> s The initial state is graphically indicated by a transition coming from nothing.	<input type="text" value="s"/> Show answer <input type="button" value="Check"/>
2	(b) <input checked="" type="checkbox"/> The initial state is s, which sets M = ?	<input type="text" value="t"/> Show answer <input type="button" value="Check"/>

Editions paradigm

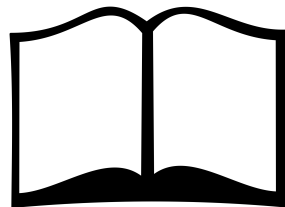
Authors



1st edition, 2010

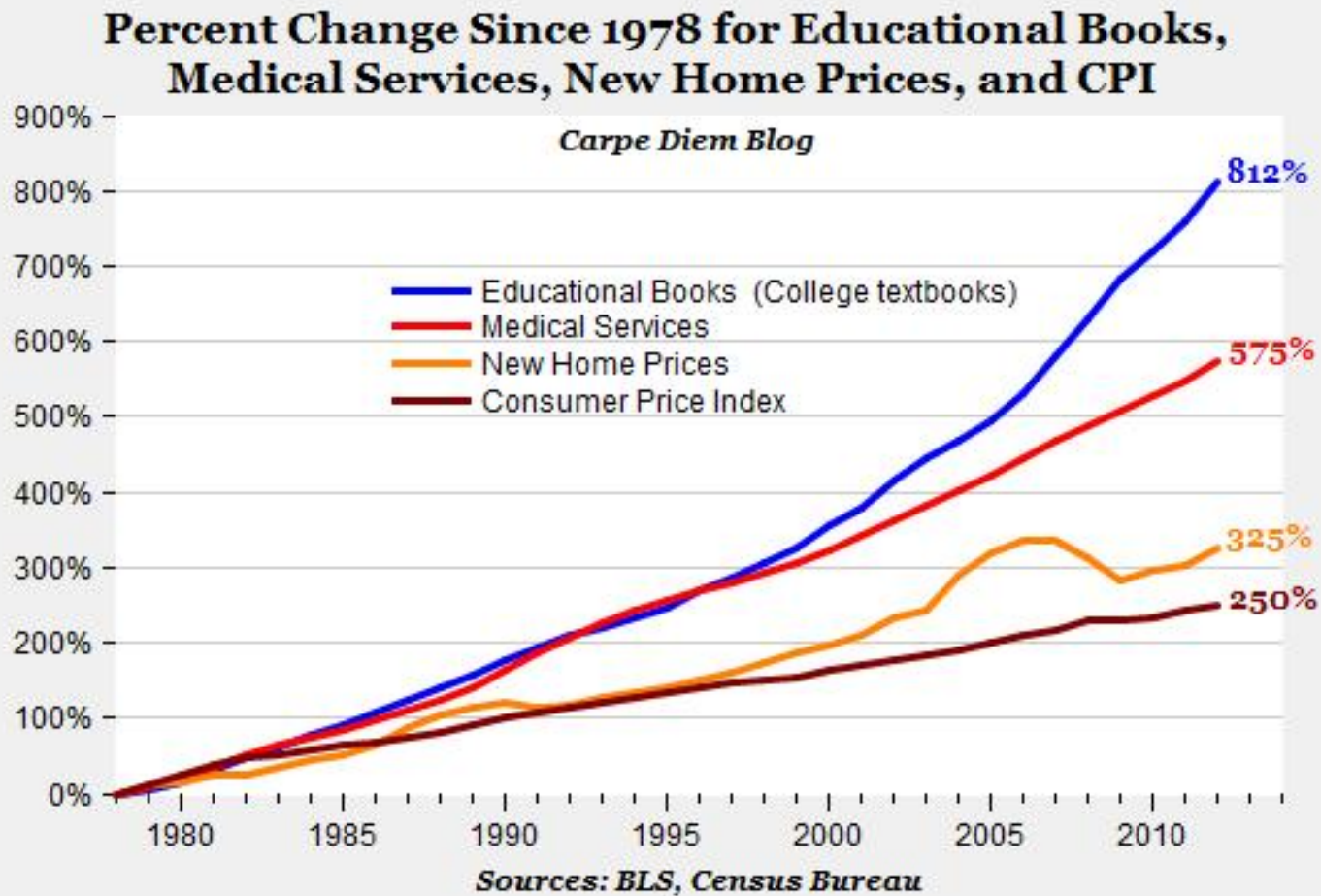


2nd edition, 2012



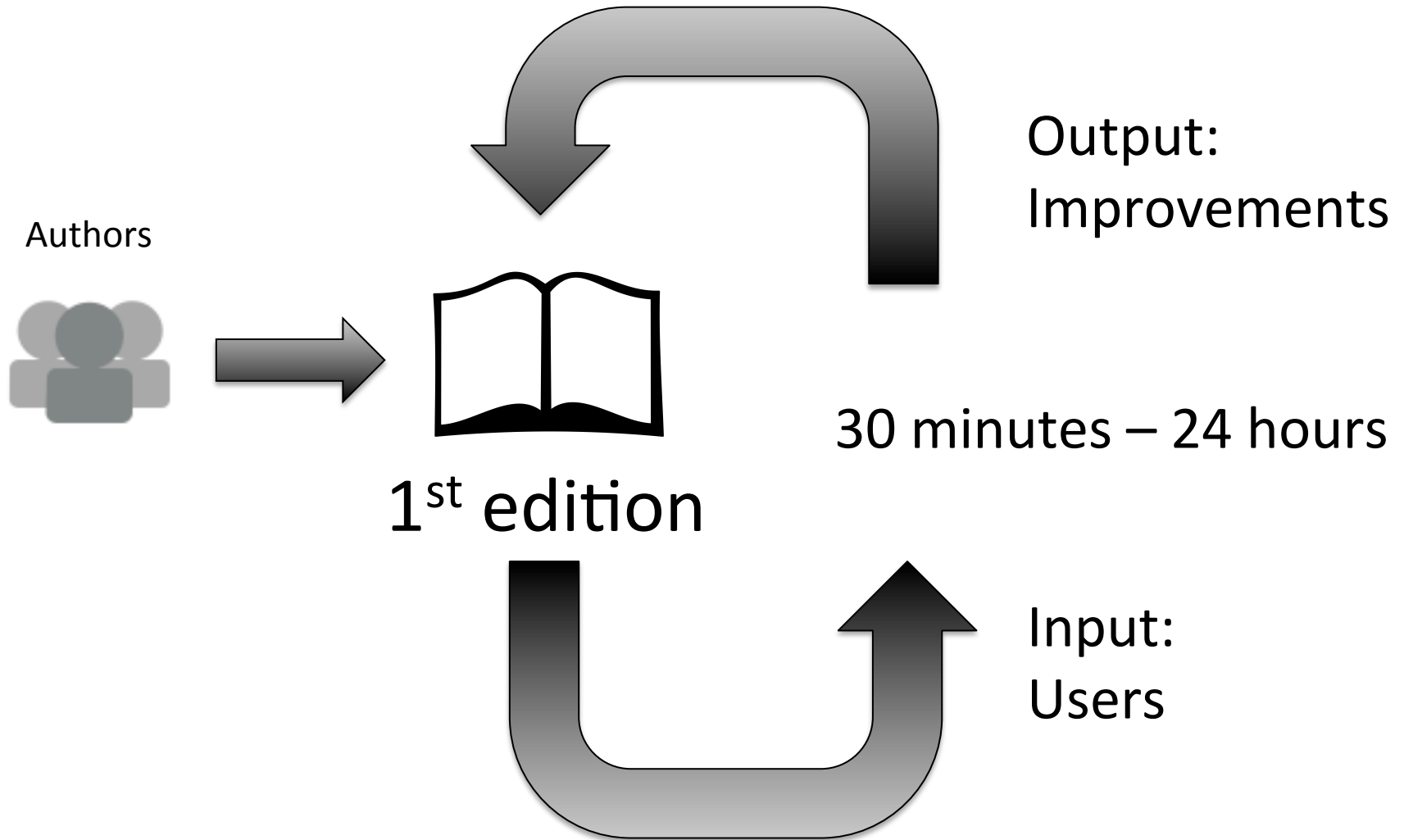
3rd edition, 2015

Editions paradigm

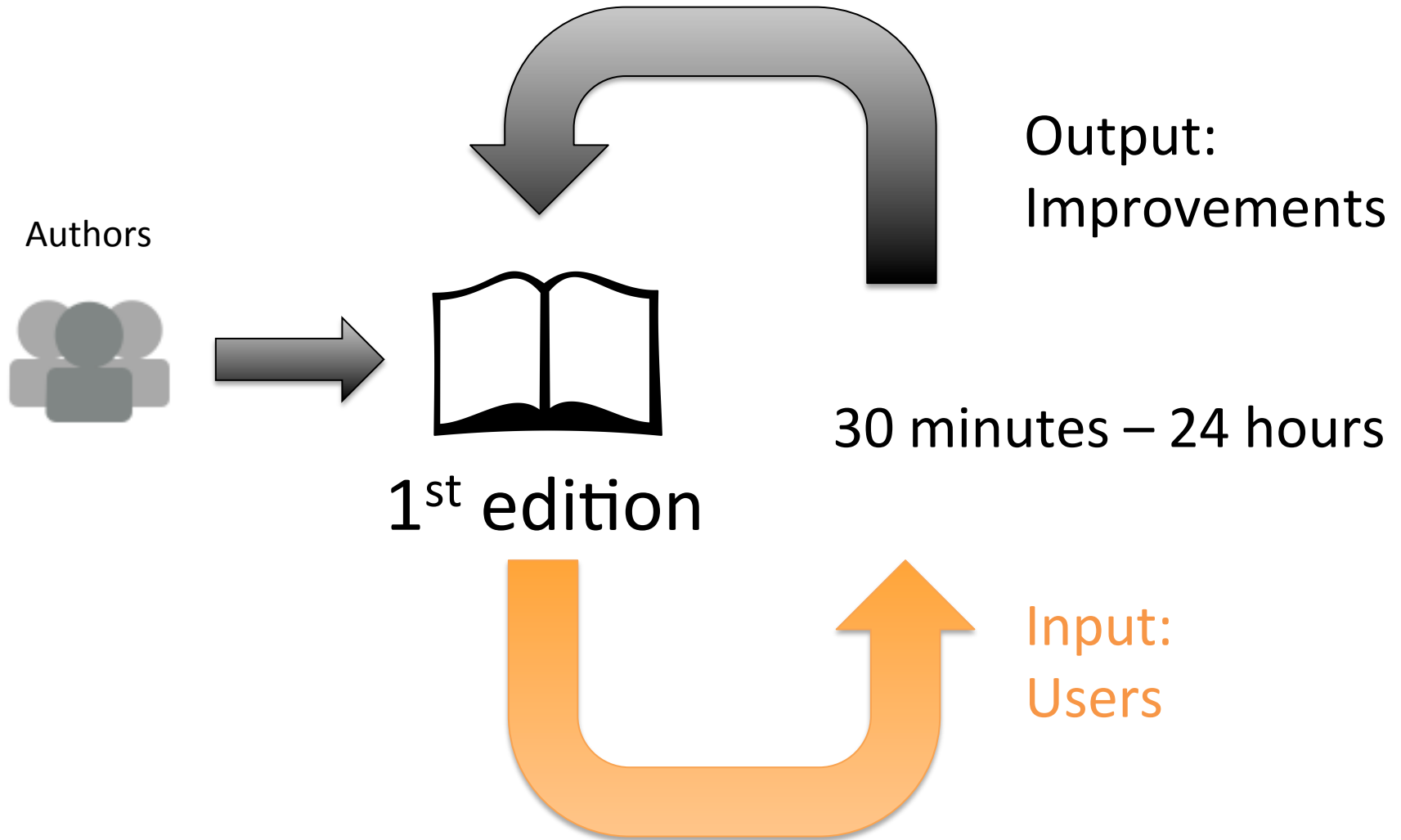


The web enables a break from tradition...

Continual improvement paradigm



Continual improvement paradigm - Input



Input source: First-time incorrect data

Figure 2: First-time incorrect data example.

Question	First-time incorrect %
PA 7.1.4 #2	70%
PA 7.3.9 #1	62%
PA 7.1.6 #1	38%
...	

Participation Activity 7.1.4: The struct construct.

#	Question	Your answer
1	A struct declaration for CartesianPoint has subitems int x and int y. How many int locations in memory does the struct declaration allocate?	<input type="text"/> Show answer <input type="button" value="Check"/>
2	If struct declaration CartesianPoint has subitems int x and int y, how many total int locations in memory are allocated for these variable definitions? int myNum; CartesianPoint myPoint1; CartesianPoint myPoint2;	<input type="text"/> Answer shown. Show answer <input type="button" value="Check"/>

5
1 for myNum.
2 for myPoint1 (1 for x, 1 for y).
2 for myPoint2.

PA 7.1.4 #2	
Incorrect answers	Frequency
4	42%
2	30%
0	18%
1	10%

Input source: First-time incorrect data

A wrong answer indicates:

- Need better content
- Unclear question
- “Trick” question

Input source: Earnestness

Students can show the answer to get points

Figure 1: zyBooks' learning questions: Short answer samples.

5	<p>NOT(a) AND NOT(b)</p> <p>✓ <input type="text" value="a'b'"/></p> <p>Each NOT becomes ' , then abut.</p>	<input type="text" value="a'b'"/> Show answer <input type="button" value="Check"/>
6	<p>NOT(ab)</p> <p>✗ The ' goes to the right of the (...).</p>	<input type="text" value="ab "/> Show answer <input type="button" value="Check"/>
7	<p>NOT(a OR b)</p> <p><input type="text" value="(a + b)'"/></p> <p>(a OR b) becomes (a + b). Then the NOT becomes ' on the right.</p>	<input type="text"/> <i>Answer shown.</i> Show answer <input type="button" value="Check"/>

Earnestness analysis indicates if a question is too hard or confusing

Input source: User feedback

Select the conditional statement that has the same logical meaning as the English sentence given.

#	Question	Your answer
1	If you share your soda with me, then I will share my cookie with you.	$q \rightarrow p$
		$p \rightarrow q$
2	My sharing my cookie with you is sufficient for you to share your soda with me.	$q \rightarrow p$
		$p \rightarrow q$
3	I will share my cookie with you only if you share your soda with me.	$q \rightarrow p$
		$p \rightarrow q$

Figure 3: Feedback buttons are integrated throughout the material to help encourage user feedback.

Feedback?

My comments describe a bug

Number 3 seems to be written incorrectly.



Submit feedback

Input source: User feedback

The screenshot shows a web application interface for managing tickets. On the left is a sidebar with navigation options. The main area displays a table of tickets under the heading 'Tickets requiring attention'. The table has columns for Satisfaction, Subject, Requester, Requested, and Assignee. The first row is highlighted, showing a ticket with 'Unoffered' satisfaction and the subject 'Bug reported for CRID: 2499565'.

Views

- Tickets requiring attention: 6
- Your unsolved tickets: 13
- Unassigned tickets: 12
- All unsolved tickets: 61
- Recently updated tickets: ~40
- New tickets in your groups: 12
- Pending tickets: 55
- Recently solved tickets: 47
- Unsolved tickets in your groups: 61
- Rated tickets from the last 7 days: 0
- Suspended tickets: 13

Tickets requiring attention
6 tickets

<input type="checkbox"/>	Satisfaction	Subject	Requester	Requested	Assignee
<input type="checkbox"/>	Unoffered	Bug reported for CRID: 2499565	Nikolas Burks	44 minutes ago	-
<input type="checkbox"/>	Unoffered	Bug reported for CRID: 2499565	Nikolas Burks	about 1 hour ago	-
<input type="checkbox"/>	Unoffered	* Bug reported for CRID: 2414873	rrenno student	Today 12:49	-
<input type="checkbox"/>	Unoffered	[zyBooks Support] Discrete Math	Nelson Max	Today 12:36	-
<input type="checkbox"/>	Unoffered	[zyBooks Support] Discrete Math	Nelson Max	Today 11:33	-
<input type="checkbox"/>	Unoffered	[zyBooks Support] zyLabs marked wrong but doesn't sho...	Frank Vahid	Saturday 10:24	Daniel de Haas

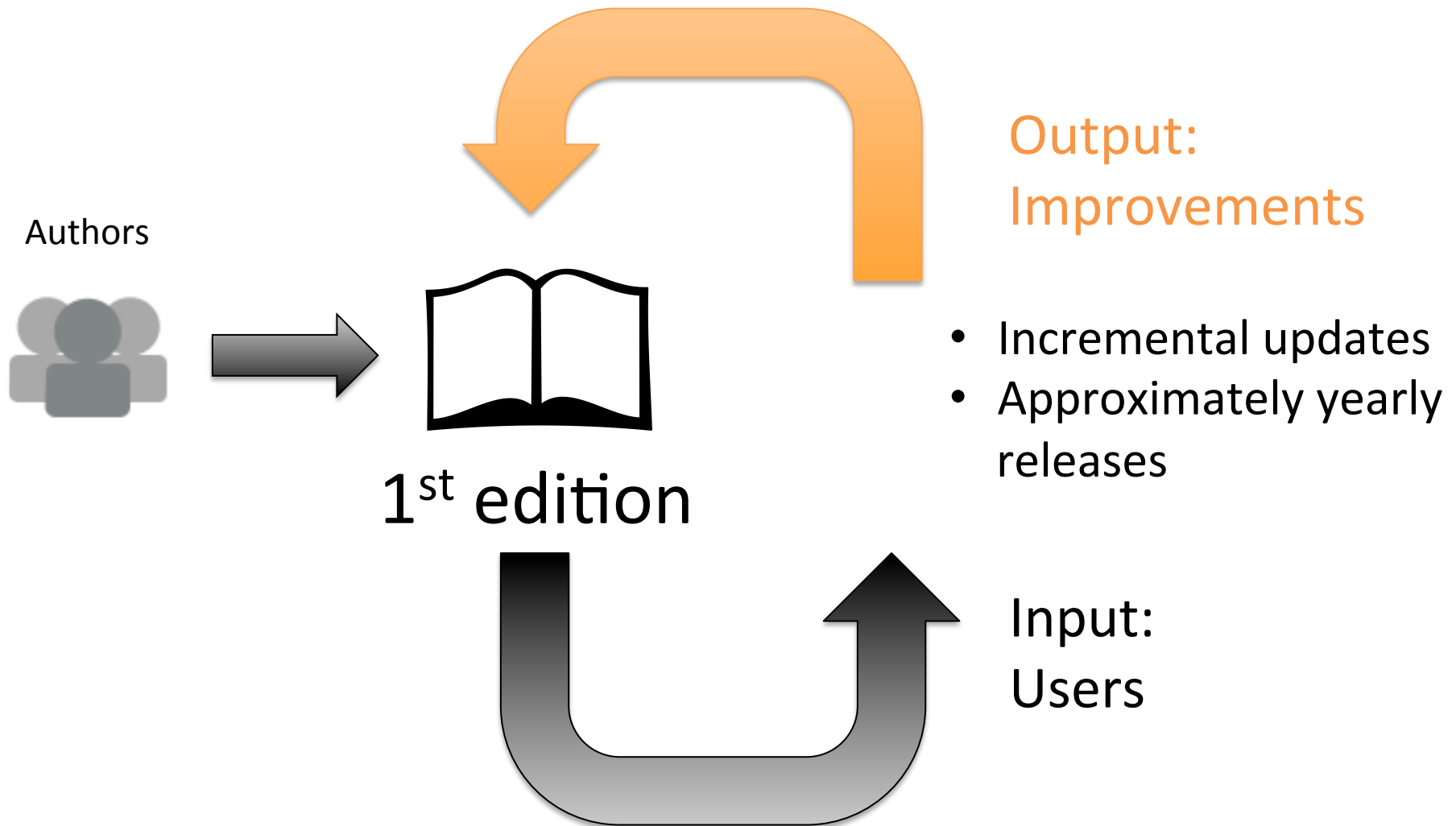
Input source: User feedback

Table 1: Feedback amounts received from instructors and students (normalized per every 100 instructors and every 10,000 students). The semester had many hundreds of instructors and tens of thousands of students.

Spring 2015 semester	Instructors (per 100 instructors)	Students (per 10,000 students)
Number that reported feedback	4.3*	952*
Avg. number of feedback items for persons that submitted at least once	4.4	2.0
Feedback marked as "bugs"	7	631
Feedback (non-bug)	12	1,295

* Actual number of feedback items is roughly 20-30% higher since the reported numbers are only via the feedback button, but we also get feedback via email.

Continual improvement paradigm - Output



Conclusion

What we've done parallels the software industry

- The web enables a new era of publishing
- Unmaintained free content degrades
- No need for artificial editions
- The web enables diverse and frequent feedback
- We aggressively solicit and capture feedback and have processes to act on that feedback quickly

We are grateful for support of this research by the NSF and Google.

Questions?