Class 16: Linking Analytics with a Business Outcomes Model

Professor Blake McShane

MKTG 482: Customer Analytics
Kellogg School of Management

Customer Analytics Course Structure

Customer Centric Marketing
- Customer Analytics and AI Overview (Class 1)
  AI and Analytics,
  Why Customer Analytics and AI Needs Customer Centricity

Getting Ready for Analytics
- Using R for Customer Analytics and AI (Class 2)
- Statistics Review (Class 3)

Targeting Customers for Acquisition and Development
- Predicting Response with RFM analysis (Class 4)
- Case Analysis: "Tuango: RFM Analysis for Mobile App Push Messaging" (Class 5)
  Lift and Gains
- Predicting Response with Logistic Regression (Class 6)
- Predicting Response with Neural Networks (Class 7)
- Using Neural Networks for Customer Analytics and AI (Class 8)
  Training Machine Learning Models
- Case Analysis: Intuit QuickBooks Upgrade: Moving to the Cloud (Class 9)
- Predicting Response with Tree Methods (Class 10)

Targeting based on Incrementality
- From Propensity to Uplift (Class 11)
- The Causality Checklist (Class 12)
- Case Analysis: Creative Gaming Uplift Modeling (Class 13)
- Hyper-Personalization: Next-Product-to-Buy Models (Class 14)

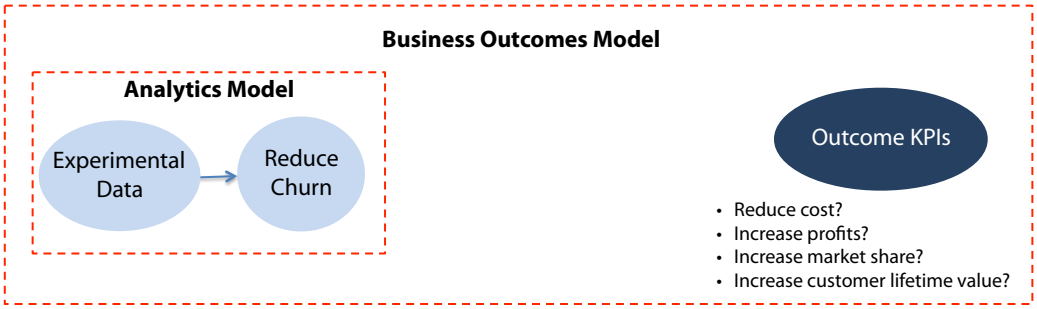
Retaining Customers
- Predicting Attrition (Class 15)
- Linking Analytics with a Business Outcomes Model (Class 16)
- Case Analysis: "S-Mobile: Churn Management" (Class 17)
  From Prediction to Action

Selecting the Right Offers
- Design of Experiments / Multivariate Testing (Class 18)
- Case Analysis: "Capital One: Information-Based Credit Card Design" (Class 19)

Scaling Analytics
- Scaling Analytics in Practice (Class 20)
  Course Wrap-up

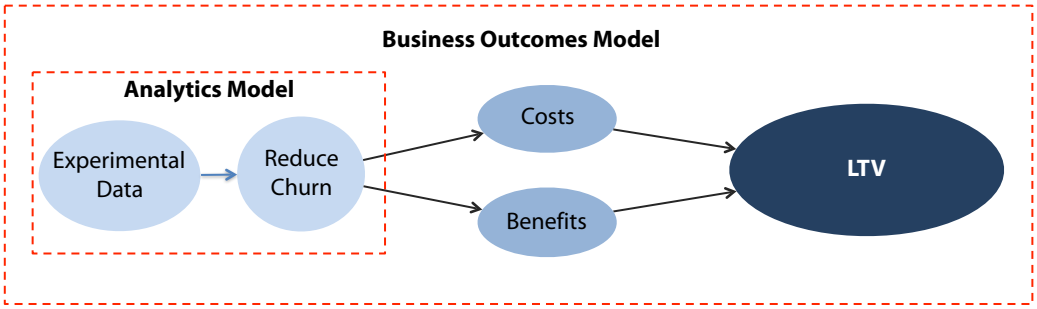
First, you need to decide what business outcomes matter

EXAMPLE: CHURN MANAGEMENT



When revenues and costs accrue over time, the lifetime value of a customer is a helpful business outcome

EXAMPLE: CHURN MANAGEMENT



Customer value is often measured by the revenue or profit generated by the customer

MEASURING CUSTOMER VALUE

	CASH FLOW	
	Inflow	In- and Outflow
	Revenue	Profit

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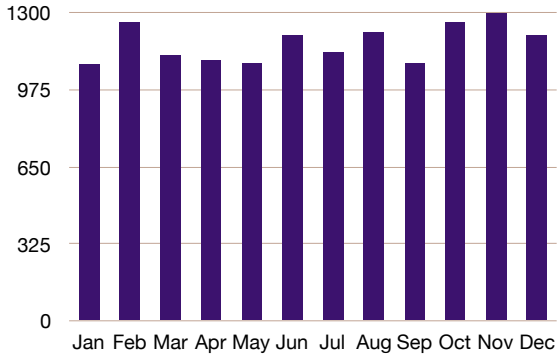
MEASURING CUSTOMER VALUE

		CASH FLOW	
		Inflow	In- and Outflow
FOCUS	Past	Revenue	Profit
	Future		Life Time Value (LTV)

Amazon Web Services (AWS) wants to determine the value of boutique analytics consulting companies

AVERAGE CUSTOMER REVENUE IN PAST YEAR



- Yearly revenue: $14,044
- Cost to service: 42% of revenue –> $5,898
- Yearly direct marketing costs: 6% –> $843

The value of boutique analytics consulting companies is $7,303

CUSTOMER VALUE CALCULATION

	One Year
Revenue	$14,044
Product/ Service Cost	$5,898
Marketing Cost	$843
Profit	$7,303

The value of boutique analytics consulting companies is $7,303

CUSTOMER VALUE CALCULATION

	One Year
Revenue	$14,044
Product/ Service Cost	$5,898
Marketing Cost	$843
Profit	$7,303

	Inflow	In- and Outflow
Past	Revenue	Profit
Future		Life Time Value (LTV)

We can calculate the value looking into the future

CUSTOMER VALUE CALCULATION

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$14,044	$14,044	$14,044	$14,044	$14,044
Product/Service Cost	$5,898	$5,898	$5,898	$5,898	$5,898
Marketing Cost	$843	$843	$843	$843	$843
Profit	$7,303	$7,303	$7,303	$7,303	$7,303

Total Customer Value: 5•$7,303 = $36,515

We can calculate the value looking into the future

CUSTOMER VALUE CALCULATION

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$14,044	$14,044	$14,044	$14,044	$14,044
Product/Service Cost	$5,898	$5,898	$5,898	$5,898	$5,898
Marketing Cost	$843	$843	$843	$843	$843
Profit	$7,303	$7,303	$7,303	$7,303	$7,303

Total Customer Value: 5•$7,303 = $36,515

What is wrong with this way of calculating LTV?

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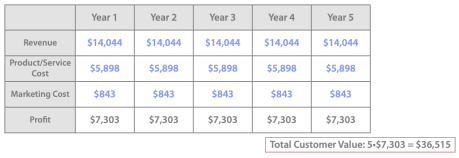

IN REALITY …

- Revenues and costs change over time (“Times change”)
- Customer may not be around in 5 years (“Customer Churn)
- Profits earned in 5 years are less valuable than profits earned today (“Time Value of Money”)

An LTV calculation starts at a specific moment in time

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0					
Product/ Service Cost	$0					
Marketing Cost	$0					
Profit	$0					

An LTV calculation always compares two or more scenarios

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0					
Product/ Service Cost	$0					
Marketing Cost	$0					
Profit	$0					

Benchmark

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0					
Product/ Service Cost	$100					
Marketing Cost	$0					
Profit	-$100					

New Initiative

How do we build our benchmark LTV?

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0					
Product/ Service Cost	$0					
Marketing Cost	$0					
Profit	$0					

Last Year:

- Yearly revenue: $14,044
- Cost to service: 42% of revenue –> $5,898
- Yearly direct marketing costs: 6% –> $843

We need to make some assumptions about the future based on data from the past

ASSUMPTIONS

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%
- Financial discount rate: 10%

How do we build our benchmark LTV?

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215				
Product/ Service Cost	$0	$6,390				
Marketing Cost	$0	$913				
Profit	$0	$7,912				

- Yearly revenue growth: 8%
- Yearly cost growth: 8%

Last Year:

- Yearly revenue: $14,044
- Cost to service: 42% of revenue –> $5,898
- Yearly direct marketing costs: 6% –> $843

Fix 1: Times change

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764

- Yearly revenue growth: 8%
- Yearly cost growth: 8%

Fix 2: Customers churn

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%					
Average prob. of being active *in period*	100%					

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

Fix 2: Customers churn

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
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Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%				
Average prob. of being active *in period*	100%					

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

Fix 2: Customers churn

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
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Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%				
Average prob. of being active *in period*	100%	90%				

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

Fix 2: Customers churn

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
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Prob. of being active *at end of period*	100%	80%				
Average prob. of being active *in period*	100%	90%				
Expected Profit						

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

Fix 2: Customers churn

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Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%				
Average prob. of being active *in period*	100%	90%				
Expected Profit	$0	$7,121				

90% Probability: Profit $7,912
10% Probability: Profit $0
Average: $7,121

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

Fix 2: Customers churn

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%	64%			
Average prob. of being active *in period*	100%	90%	72%			
Expected Profit	$0	$7,121				

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

Fix 2: Customers churn

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Average prob. of being active *in period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121				

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

Fix 2: Customers churn

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
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Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
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Average prob. of being active *in period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152			

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

72% Probability: Profit $8,545
28% Probability: Profit $0
Average: $6,152

Fix 2: Customers churn

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Average prob. of being active *in period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%

Fix 3: Time value of money

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
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Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Average prob. of being active *in period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968
Present Value of Exp. Profit	$0					

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%
- Discounting: 10% per year

Fix 3: Time value of money

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
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Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Average prob. of being active *in period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968
Present Value of Exp. Profit	$0	$6,789				

10% discount rate (mid-year):
$7,121 / (1.1^0.5) = $6,789

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%
- Discounting: 10% per year

Fix 3: Time value of money

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
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Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Average prob. of being active *in period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968
Present Value of Exp. Profit	$0	$6,789	$5,333			

10% discount rate:
$6,152 / (1.1^1.5) = $5,333

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%
- Discounting: 10% per year

Fix 3: Time value of money

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
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Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Average prob. of being active *in period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968
Present Value of Exp. Profit	$0	$6,789	$5,333	$4,189	$3,290	$2,584

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%
- Discounting: 10% per year

Fix 3: Time value of money

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
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Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Average prob. of being active *in period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968
Present Value of Exp. Profit	$0	$6,789	$5,333	$4,189	$3,290	$2,584
				Customer Lifetime Value (LTV):		$22,184

- Yearly revenue growth: 8%
- Yearly cost growth: 8%
- Yearly churn (attrition): 20%
- Discounting: 10% per year

Why 5 years and not a “Lifetime”?

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764
Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Prob. of being active *within period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968
Present Value of Exp. Profit	$0	$6,789	$5,333	$4,189	$3,290	$2,584
					Customer Lifetime Value (LTV):	$22,184

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700	$22,356	$24,144	$26,076	$28,162	$30,415	$32,848	$35,476	$38,314	$41,379	$44,690	$48,265	$52,126	$56,296	$60,800	$65,664
Product/ Service Cost	$0	$6,390	$6,902	$7,454	$8,050	$8,694	$9,389	$10,141	$10,952	$11,828	$12,774	$13,796	$14,900	$16,092	$17,379	$18,770	$20,271	$21,893	$23,644	$25,536	$27,579
Marketing Cost	$0	$913	$986	$1,065	$1,150	$1,242	$1,341	$1,449	$1,565	$1,690	$1,825	$1,971	$2,129	$2,299	$2,483	$2,681	$2,896	$3,128	$3,378	$3,648	$3,940
Profit	$0	$7,912	$8,545	$9,228	$9,967	$10,764	$11,625	$12,555	$13,559	$14,644	$15,816	$17,081	$18,448	$19,923	$21,517	$23,239	$25,098	$27,105	$29,274	$31,616	$34,145
Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%	26%	21%	17%	13%	11%	9%	7%	5%	4%	4%	3%	2%	2%	1%	1%
Prob. of being active *within period*	100%	90%	72%	58%	46%	37%	29%	24%	19%	15%	12%	10%	8%	6%	5%	4%	3%	3%	2%	2%	1%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968	$3,428	$2,962	$2,559	$2,211	$1,910	$1,651	$1,426	$1,232	$1,065	$920	$795	$687	$593	$513	$443
Present Value of Exp. Profit	$0	$6,789	$5,333	$4,189	$3,290	$2,584	$2,233	$1,929	$1,667	$1,440	$1,244	$1,075	$929	$802	$693	$599	$518	$447	$386	$334	$288
																		Customer Lifetime Value (LTV):			$36,769

Why do we care about the LTV of customers?

Why do we care about the LTV of customers?

TYPICAL USES FOR LTV CALCULATIONS

Acquisition	Development	Retention
- Should we extend a gift of appreciation to first-time customers? - How much can we pay a salesperson to acquire a customer? - Should we lower the upfront fee for customers?	- What features will most appeal to existing customers? - Which incentives should we offer customers to spend more?	

Recall the Amazon cloud example

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Revenue	$0	$15,215	$16,432	$17,747	$19,167	$20,700
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Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Prob. of being active *within period*	100%	90%	72%	58%	46%	37%
Expected Profit	$0	$7,121	$6,152	$5,316	$4,593	$3,968
Present Value of Exp. Profit	$0	$6,789	$5,333	$4,189	$3,290	$2,584
				Customer Lifetime Value (LTV):		$22,184

Amazon wants to assess whether a 3-day training visit by a AWS specialist to boutique analytics companies might pay off

TRAINING PROGRAM

- 3 day visit
- Cost of visit $1,000 / day
- Projected revenue increase:
  - $1,000 bump in first year
  - Grows organically

This is clearly a bad idea!

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$16,215	$17,512	$18,913	$20,426	$22,060
Product/ Service Cost	$0	$6,810	$7,355	$7,944	$8,579	$9,265
Marketing Cost	$3,000	$973	$1,051	$1,135	$1,226	$1,324
Profit	-$3,000	$8,432	$9,106	$9,835	$10,622	$11,471
Prob. of being active *at end of period*	100%	80%	64%	51%	41%	33%
Prob. of being active *within period*	100%	90%	72%	58%	46%	37%
Expected Profit	-$3,000	$7,589	$6,557	$5,665	$4,894	$4,229
Present Value of Exp. Profit	-$3,000	$7,235	$5,683	$4,464	$3,506	$2,754
				Customer Lifetime Value (LTV):		$20,643
				Was:		$22,184

This would work, but can we get the $1000 revenue bump with 1 day?

	Start of LTV Calc.	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	$0	$16,215	$17,512	$18,913	$20,426	$22,060
Product/ Service Cost	$0	$6,810	$7,355	$7,944	$8,579	$9,265
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Present Value of Exp. Profit	-$1,000	$7,235	$5,683	$4,464	$3,506	$2,754
				Customer Lifetime Value (LTV):		$22,643
				Was:		$22,184

Why do we care about the LTV of customers?

TYPICAL USES FOR LTV CALCULATIONS

Acquisition

- Should we extend a gift of appreciation to first-time customers?
- How much can we pay a salesperson to acquire a customer?
- Should we lower the upfront fee for customers?

Development

- What features will most appeal to existing customers?
- Which incentives should we offer customers to spend more?

Retention

- Does it pay to reduce the average call center response time from 8 to 2 minutes?
- Should we proactively lower service fees for at-risk customers?

LTV analytics can become a key managerial tool