# Business Value of Agile Methods

# Using ROI & Real Options Dr. David F. Rico, PMP, CSM

Website: <u>http://davidfrico.com</u> Biography: <u>http://www.linkedin.com/in/davidfrico</u>

## Agenda

Introduction to Agile Methods **Types of Agile Methods Practices of Agile Methods Benefits of Agile Methods Costs of Traditional Methods Costs of Agile Methods** Value of Agile Methods **Comparison of Agile Methods Summary of Business Value** 

#### **Author**

DoD contractor with 25+ years of IT experience
 B.S. Comp. Sci., M.S. Soft. Eng., D.M. Info. Tech.
 Large NASA & DoD programs (U.S., Japan, Europe)



#### Purpose

- Provide an overview of the business value of Agile Methods using <u>return on investment</u>:
  - Business value is an approach for estimating the <u>tangible</u> and <u>intangible</u> worth of organizational assets
  - Business value is an appraisal of intellectual assets such as <u>knowledge</u>, <u>experience</u>, and <u>skills</u>
  - Business value is a technique for determining the complete worth of an investment to an enterprise
  - Business value is a method of determining the health and well-being of a firm in the long-run
  - Business value includes employee, customer, supplier, alliance, management, and societal value

# What is Agility?

- A-gil-i-ty (ə-'ji-lə-tē) Quickness, lightness, and ease of movement; <u>nimbleness</u>
  - **Agility** is the ability to create and respond to change in order to profit in a turbulent business environment
  - **Agility** *is reprioritizing for maneuverability because of shifting requirements, technology, and knowledge*
  - Agility is a very fast response to changes in customer requirements through intensive customer interaction
  - **Agility** *is the use of adaptability and evolutionary delivery to promote rapid customer responsiveness*
  - Agility is a better way of developing products using collaboration, teamwork, iterations, and flexibility

# What are Agile Methods?

Adaptable' software development methodologies
 'Human-centric' method for creating business value
 'Alternative' to large document-based methodologies



Agile Manifesto. (2001). Manifesto for agile software development. Retrieved September 3, 2008, from http://www.agilemanifesto.org

# **Essence of Agile Methods**

High degree of customer & developer interaction
 Highly-skilled teams producing frequent iterations
 Right-sized, just-enough, and just-in-time process



Highsmith, J. A. (2002). Agile software development ecosystems. Boston, MA: Addison-Wesley.

# Why use Agile Methods?

Adaptability to changing market/customer needs
 Better cost efficiencies and fastest time-to-market
 Improved quality, satisfaction, and project success



## Agenda

**Introduction to Agile Methods** Types of Agile Methods **Practices of Agile Methods Benefits of Agile Methods Costs of Traditional Methods Costs of Agile Methods** Value of Agile Methods **Comparison of Agile Methods Summary of Business Value** 

## **Crystal Methods**

Created by Alistair Cockburn in 1991
 Has 14 practices, 10 roles, and 25 products
 Scalable family of techniques for critical systems



Cockburn, A. (2002). Agile software development. Boston, MA: Addison-Wesley.

#### Scrum

Created by Jeff Sutherland at Easel in 1993
 Has 5 practices, 3 roles, 5 products, rules, etc.
 Uses EVM to burn down backlog in 30-day iterations



COPYRIGHT © 2005, MOUNTAIN GOAT SOFTWARE

Schwaber, K., & Beedle, M. (2001). Agile software development with scrum. Upper Saddle River, NJ: Prentice-Hall.

# **Dynamic Systems Develop.**

Created by group of British firms in 1993
 15 practices, 12 roles, and 23 work products
 Non-proprietary RAD approach from early 1990s



Stapleton, J. (1997). DSDM: A framework for business centered development. Harlow, England: Addison-Wesley.

#### **Feature Driven Development**

Created by Jeff De Luca at Nebulon in 1997
 Has 8 practices, 14 roles, and 16 work products
 Uses object-oriented design and code inspections



## **Extreme Programming**

Created by Kent Beck at Chrysler in 1998
 Has 28 practices, 7 roles, and 7 work products
 Popularized pair programming and test-driven dev.



Beck, K. (2000). Extreme programming explained: Embrace change. Reading, MA: Addison-Wesley.

## Agenda

**Introduction to Agile Methods Types of Agile Methods** Practices of Agile Methods **Benefits of Agile Methods Costs of Traditional Methods Costs of Agile Methods** Value of Agile Methods **Comparison of Agile Methods Summary of Business Value** 

#### RELEASE PLANNING — Best Practice

- Created by Kent Beck at Chrysler in 1998
- Lightweight project management framework
- Used for managing both XP and Scrum projects



Beck, K., & Fowler, M. (2004). Planning extreme programming. Upper Saddle River, NJ: Addison-Wesley.

#### PAIR PROGRAMMING — Best Practice

- Term coined by Jim Coplien in 1995
- Consists of two side-by-side programmers
- Highly-effective group problem-solving technique



Williams, L., & Kessler, R. (2002). Pair programming illuminated. Boston, MA: Pearson Education.

#### REFACTORING — Best Practice

- Term coined by William Opdyke in 1990
- Process of frequently rewriting source code
- Improves readability, maintainability, and quality



Fowler, M. (1999). Refactoring: Improving the design of existing code. Boston, MA. Addison-Wesley.

#### **TEST-DRIVEN DEV.** — Best Practice

- Term coined by Kent Beck in 2003
- Consists of writing all tests before coding
- Ensures all source code is verified and validated



Beck, K. (2003). Test-driven development: By example. Boston, MA: Addison-Wesley.

#### **CONT. INTEGRATION — Best Practice**

- Term coined by Martin Fowler in 1998
- Process of automated build/regression testing
- Evaluates impact of all changes against entire system



Duvall, P., Matyas, S., & Glover, A. (2006). Continuous integration: Improving software quality and reducing risk. Boston, MA: Addison-Wesley

## Agenda

**Introduction to Agile Methods Types of Agile Methods Practices of Agile Methods Benefits of Agile Methods** (F **Costs of Traditional Methods Costs of Agile Methods** Value of Agile Methods **Comparison of Agile Methods Summary of Business Value** 

# **Surveys of Agile Methods**

Numerous surveys of Agile Methods since 2003
 AmbySoft and Version One collect annual data
 Generally include both hard and soft benefits

Year	Organization	Author	Size	Productivity	Quality	Cost
2003	Shine	Johnson	131	93%	88%	49%
2006	Agile Journal	Barnett	400	45%	43%	23%
2007	Microsoft	Begel, et al.	492	14%	<b>32%</b>	16%
2007	UMUC	Rico, et al.	250	81%	80%	75%
2008	AmbySoft	Ambler	642	82%	72%	72%
2008	IT Agile	Wolf, et al.	207	78%	74%	72%
2008	Version One	Hanscom	3,061	74%	68%	38%
	Ave	rage	67%	65%	49%	

# **Studies of Agile Methods**

Agile (138 pt.) and traditional methods (99 pt.)
 Agile methods fare better in all benefits categories
 Agile methods 359% better than traditional methods

#### **Agile Methods**

Category	Low	Median	High
Cost	10%	26%	70%
Schedule	11%	71%	700%
Productivity	14%	122%	712%
Quality	10%	70%	1,000%
Satisfaction	70%	70%	70%
ROI	240%	<b>2,633%</b>	8,852%

#### **Traditional Methods**

Category	Low	Median	High
Cost	3%	20%	87%
Schedule	2%	37%	90%
Productivity	9%	62%	255%
Quality	7%	50%	132%
Satisfaction	-4%	14%	55%
ROI	200%	470%	2,770%

# **Analysis of Agile Methods**

Analysis of 29 agile projects involving 839 people
 Agile projects are 550% better than traditional ones
 XP (753%) and Scrum (148%) better than traditional

Method	Productivity	Quality	Cost	Benefits	ROI	NPV	<b>Real Options</b>
ХР	<b>XP</b> 1,422% 1,195% 712% 45% 1,695%		1,695%	142%	62%		
Agile	1,900%	438%	389%	42%	935%	131%	56%
TDD	2,657%	349%	344%	41%	830%	128%	54%
PP	3,046%	310%	318%	40%	767%	126%	53%
Scrum	413%	145%	92%	30%	236%	87%	37%

#### **Agile vs. Traditional Benefits**

Rico, D. F., Sayani, H. H., & Sone, S. (2009). The business value of agile software methods. Ft. Lauderdale, FL: J. Ross Publishing.

# **Projects Using Agile Methods**

Analysis of 23 agile vs. 7,500 traditional projects
 Agile projects are 41% better than traditional ones
 XP (56%) and Scrum (26%) better than trad. projects

Category	XP	Scrum	Agile
Time-to-Market	62%	138%	100%
Quality	100%	12%	56%
People	40%	-57%	-8%
Cost	21%	30%	26%
Productivity	59%	6%	32%

#### **Agile vs. Traditional Benefits**

Mah, M. (2008). Measuring agile in the enterprise: Proceedings of the Agile 2008 Conference, Toronto, Canada.

# **Projects Using Agile Tools**

Analysis of 29 agile vs. 7,500 traditional projects
 Agile projects are 33% better than traditional ones
 Rally projects are 28% better than traditional ones

Category	Agile	Rally	Total No.
Time-to-Market	37%	50%	80%
Productivity	16%	25%	33%
Quality	33%	8.3%	40%

#### **Agile vs. Traditional Benefits**

Rally Software. (2009). The agile impact report. Boulder, CO: Author.

## Agenda

**Introduction to Agile Methods Types of Agile Methods Practices of Agile Methods Benefits of Agile Methods** Costs of Traditional Methods **Costs of Agile Methods** Value of Agile Methods **Comparison of Agile Methods Summary of Business Value** 

### **Software Lifecycle Costs**

1:10:100 ratio forms a basic model to estimate ROI
 Defects have negative multiplicative effect on cost
 Agile methods leave fewer defects (higher ROI)



Boehm, B. W. (1981). Software engineering economics. Englewood Cliffs, NJ: Prentice-Hall.

## Software Cost Models

Cost estimation models still in use today
 Used to estimate effort of Traditional Methods
 Adjusted average of 5,088 used for ROI estimation

Source	Model	LOC	Months	Hours	<b>Years</b>			
сосомо-о	Months = $2.4 \times \text{KLOC}^{1.05}$	10,000	26.93	4,667.60	2.24			
COCOMO-S	Months = $3.0 \times \text{KLOC}^{1.12}$	10,000	39.55	6,854.94	3.30			
COCOMO-E	Months = $3.6 \times \text{KLOC}^{1.20}$	10,000	57.06	9,889.73	4.75			
COCOMO-II	Months = $2.9 \times \text{KLOC}^{1.10}$	10,000	36.51	6,328.20	3.04			
Walston-Felix	Months = $5.2 \times \text{KLOC}^{0.91}$	10,000	42.27	7,326.31	3.52			
Bailey-Basili	Months = $5.5 + 0.73 \times \text{KLOC}^{1.15}$	10,000	15.81	2,740.66	1.32			
Doty	Months = $5.288 \times \text{KLOC}^{1.047}$	10,000	58.92	10,213.48	4.91			
	Average 39.58 6,860.13 3.							
* (6,8	* (6,854.94 + 7,326.31 + 2,740.66 + 10,213.48) ÷ 4 × 0.75 € 5,087.89							

# **Total Lifecycle Costs**

0.51 hours/line of code for Traditional Methods
 10% defect inject rate (1,000 defects/10 KLOC)
 67% of defects in test (33% in maintenance)

Step	Total Lifecycle Cost Model
1.	$0.51 \times Size + 100 \times IR \times Size - 100 \times IH - 10 \times TH + IH + TH$
2.	$0.51 \times Size + 100 \times 10\% \times Size - 100 \times IH - 10 \times TH + IH + TH$
3.	$0.51 \times Size + 10 \times Size - 100 \times IH - 10 \times TH + IH + TH$
4.	$0.51 \times Size + 10 \times Size - 99 \times IH - 9 \times TH$
5.	$10.51 \times Size - 99 \times IH - 9 \times TH$
6.	10.51 × 10,000 - 0 - 9 × 6,666.67
7.	<b>45,099.97</b> <sup>*</sup> hours or <b>\$4,509,997</b>

\* 5,087.89 Development Hours + 6,666.67 Test Hours + 33,345.41 Maintenance Hours

Rico, D. F. (2004). *ROI of software process improvement: Metrics for project managers and software engineers*. Boca Raton, FL: J. Ross Publishing. In, H. P., et al. (2006). A quality-based cost estimation model for the product line life cycle. *Communications of the ACM*, 49(12), 85-88. McCann, B. (2007). The relative cost of interchanging, adding, or dropping quality practices. *Crosstalk*, 20(6), 25-28.

## Agenda

**Introduction to Agile Methods Types of Agile Methods Practices of Agile Methods Benefits of Agile Methods** Costs of Traditional Methods Costs of Agile Methods Value of Agile Methods **Comparison of Agile Methods Summary of Business Value** 

# **Agile Cost Models**

Based on 13 studies of Extreme Programming (XP)
 Also based on 7 studies of pair programming (PP)
 "Pair programming" had highest productivity

No.	Method	Low	Median	High	<b>Pts</b> .	Productivity
1.	ХР	3.5000	16.1575	43.0000	13	LOC ÷ 16.1575
2.	TDD	12.3800	29.2800	46.1800	2	LOC ÷ 29.2800
3.	PP	15.4667	33.4044	86.4502	8	LOC ÷ 33.4044
4.	Scrum	4.6858	5.4436	5.9050	3	LOC ÷ 05.4436
5.	Agile	3.5000	21.2374	86.4502	26	LOC ÷ 21.2374

# **Agile Quality Models**

Based on 10 studies of Extreme Programming (XP)
 Also based on 6 studies of pair programming (PP)
 "Extreme Programming" had the highest quality

No.	Method	Low	Median	High	<b>Pts</b> .	Quality
1.	ХР	0.0032	0.7466	2.1450	10	$0.7466 \times \text{KLOC} \times 100$
2.	TDD	0.6100	2.1550	3.7000	2	$2.1550 \times \text{KLOC} \times 100$
3.	PP	0.3250	2.3550	5.8500	6	$2.3550 \times \text{KLOC} \times 100$
4.	Scrum	0.4350	3.9450	8.5000	3	$3.9450 \times \text{KLOC} \times 100$
5.	Agile	0.0032	1.7972	8.5000	21	$\textbf{1.7972} \times \textbf{KLOC} \times \textbf{100}$

# **Agile Lifecycle Cost Models**

Costs based on productivity and quality models
 Development costs based on LOC ÷ productivity rate
 Maintenance costs based on defects × KLOC × MH

No.	Method	Agile Lifecycle Cost Models	Costs
1.	ХР	(10,000 ÷ <b>16.1575</b> + <b>0.7466</b> × 10 × 100) × 100	\$136,548
2.	TDD	(10,000 ÷ <b>29.2800</b> + <b>2.1550</b> × 10 × 100) × 100	\$249,653
3.	PP	(10,000 ÷ <b>33.4044</b> + <b>2.3550</b> × 10 × 100) × 100	\$265,437
4.	Scrum	(10,000 ÷ <b>05.4436</b> + <b>3.9450</b> × 10 × 100) × 100	\$578,202
5.	Agile	(10,000 ÷ <b>21.2374</b> + <b>1.7972</b> × 10 × 100) × 100	\$226,805

# **Agile Lifecycle Benefit Models**

Benefits based on total traditional less agile costs
 Traditional costs based LOC × dev. + maint. effort
 Traditional costs credited testing effort applied

No.	Method	Agile Lifecycle Benefit Models	<b>Benefits</b>
1.	ХР	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$136,548</b>	\$4,373,449
2.	TDD	$(10,000 \times 10.51 - 6,666.67 \times 9) \times 100 - $	\$4,260,344
3.	PP	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$265,437</b>	\$4,244,560
4.	Scrum	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$136,548</b>	\$3,931,795
5.	Agile	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$578,202</b>	\$4,283,192

## Agenda

**Introduction to Agile Methods Types of Agile Methods Practices of Agile Methods Benefits of Agile Methods Costs of Traditional Methods Costs of Agile Methods** Value of Agile Methods **Comparison of Agile Methods Summary of Business Value** 

## **Measures of Business Value**

A major principle of Agile Methods is creating value
 ROI is the measure of value within Agile Methods
 There are seven closely related ROI measures

Netric	Definition	Formula	
<b>Costs</b> Sum of Costs	Total amount of money spent	$\sum_{i=1}^{n} Cost_{i}$	
<b>Benefits</b> Sum of Benefits	Total amount of money gained	$\sum_{i=1}^{n} Benefit_{i}$	
<b>B/CR</b> Benefit to Cost Ratio	Ratio of benefits to costs	Benefits Costs	
<b>ROI</b> Return on Investment	Ratio of adjusted benefits to costs	$rac{Benefits-Costs}{Costs} imes 100\%$	
<b>NPV</b> Net Present Value	Discounted cash flows	$\sum_{i=1}^{Y_{acrs}} \frac{Benefits_i}{(1 + Discount Rate)^{Y_{acrs}}} - Costs_0$	
<b>BEP</b> Breakeven Point	Point when benefits exceed costs	New Costs Old Costs/New Costs -1	
<b>ROA</b> Real Options Analysis	Value gained from strategic delay	$N(d_1)  imes Benefits - N(d_2)  imes Costs  imes e^{-Rate  imes Years}$	
$dl = [ln(Benefits \div Costs) + (Rate + 0.5 \times Risk^2) \times Years] \div Risk \times \sqrt{Years}, d2 = dl - Risk \times \sqrt{Years}$			

## **Extreme Programming**

Costs based on *avg*. productivity and quality
 Productivity ranged from 3.5 to 43 LOC an hour
 Costs were \$136,548, benefits were \$4,373,449

Metric	Formula	Value
Costs	(10,000 ÷ <b>16.1575</b> + <b>0.7466</b> × 10 × 100) × 100	\$136,548
Benefits	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$136,548</b>	\$4,373,449
B/CR	\$4,373,449 ÷ \$136,548	32:1
ROI	( <b>\$4,373,449</b> – <b>\$136,548</b> ) ÷ <b>\$136,548</b> × 100%	3,103%
NPV	(∑≟ ( <b>\$4,373,449</b> ÷ 5) ÷ 1.05 <sup>5</sup> ) − <b>\$136,548</b>	\$3,650,401
BEP	<b>\$136,548</b> ÷ (\$4,509,997 ÷ <b>\$136,548</b> – 1)	\$4,263
ROA	NORMSDIST(5.74) × <b>\$4,373,449</b> – NORMSDIST(5.06) × <b>\$136,548</b> × EXP(-5% × 5)	\$4,267,105

## **Test Driven Development**

Costs based on *avg*. productivity and quality
 Productivity ranged from 12 to 36 LOC an hour
 Costs were \$249,653, benefits were \$4,260,344

Metric	Formula	Value
Costs	(10,000 ÷ <b>29.2800</b> + <b>2.1550</b> × 10 × 100) × 100	\$249,653
Benefits	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$249,653</b>	\$4,260,344
B/CR	<b>\$4,260,344</b> ÷ <b>\$249,653</b>	17:1
ROI	( <b>\$4,260,344</b> - <b>\$249,653</b> ) ÷ <b>\$249,653</b> × 100%	1,607%
NPV	(∑ <sub>≠1</sub> ( <b>\$4,260,344</b> ÷ 5) ÷ 1.05 <sup>5</sup> ) − <b>\$249,653</b>	\$3,439,359
BEP	<b>\$249,653</b> ÷ (\$4,509,997 ÷ <b>\$249,653</b> – 1)	\$14,629
ROA	NORMSDIST(2.83) × <b>\$4,260,344</b> – NORMSDIST(1.35) × <b>\$249,653</b> × EXP(-5% × 5)	\$4,074,506

# **Pair Programming**

Costs based on *avg*. productivity and quality
 Productivity ranged from 16 to 87 LOC an hour
 Costs were \$265,437, benefits were \$4,244,560

Metric	Formula	Value
Costs	(10,000 ÷ <b>33.4044 + 2.3550</b> × 10 × 100) × 100	\$265,437
Benefits	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$265,437</b>	\$4,244,560
B/CR	<b>\$4,244,560</b> ÷ <b>\$265,437</b>	16:1
ROI	( <b>\$4,244,560</b> – <b>\$265,437</b> ) ÷ <b>\$265,437</b> × 100%	1,499%
NPV	(∑ <sub>≠1</sub> ( <b>\$4,244,560</b> ÷ 5) ÷ 1.05 <sup>5</sup> ) − <b>\$265,437</b>	\$3,409,908
BEP	<b>\$265,437</b> ÷ (\$4,509,997 ÷ <b>\$265,437</b> – 1)	\$16,599
ROA	NORMSDIST(2.74) × <b>\$4,244,560</b> – NORMSDIST(1.20) × <b>\$265,437</b> × EXP(-5% × 5)	\$4,050,918

#### Scrum

Costs based on *avg*. productivity and quality
 Productivity ranged from 4.7 to 5.9 LOC an hour
 Costs were \$578,202, benefits were \$3,931,795

Metric	Formula	Value
Costs	(10,000 ÷ <b>5.4436</b> + <b>3.9450</b> × 10 × 100) × 100	\$578,202
Benefits	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$578,202</b>	\$3,931,795
B/CR	\$3,931,795 ÷ \$578,202	7:1
ROI	( <b>\$3,931,795</b> – <b>\$578,202</b> ) ÷ <b>\$578,202</b> × 100%	580%
NPV	(∑≟ ( <b>\$3,931,795</b> ÷ 5) ÷ 1.05 <sup>5</sup> ) − <b>\$578,202</b>	\$2,826,320
BEP	<b>\$578,202</b> ÷ (\$4,509,997 ÷ <b>\$578,202</b> – 1)	\$85,029
ROA	NORMSDIST(2.08) × <b>\$3,931,795</b> – NORMSDIST(0.06) × <b>\$578,202</b> × EXP(-5% × 5)	\$3,660,805

## **Agile Methods**

Costs based on *avg*. productivity and quality
 Productivity ranged from 3.6 to 87 LOC an hour
 Costs were \$226,805, benefits were \$4,283,192

Metric	Formula	Value
Costs	(10,000 ÷ <b>21.2374</b> + <b>1.7972</b> × 10 × 100) × 100	\$226,805
Benefits	(10,000 × 10.51 – 6,666.67 × 9) × 100 – <b>\$226,805</b>	\$4,283,192
B/CR	\$4,283,192 ÷ \$226,805	19:1
ROI	( <b>\$4,283,192</b> - <b>\$226,805</b> ) ÷ <b>\$226,805</b> × 100%	1,788%
NPV	$(\sum_{i=1}^{5} (\$4,283,192 \div 5) \div 1.05^{5}) - \$226,805$	\$3,481,992
BEP	<b>\$226,805</b> ÷ (\$4,509,997 ÷ <b>\$226,805</b> – 1)	\$12,010
ROA	NORMSDIST(3.00) × <b>\$4,283,192</b> – NORMSDIST(1.61) × <b>\$226,805</b> × EXP(-5% × 5)	\$4,110,308

## Agenda

**Introduction to Agile Methods Types of Agile Methods Practices of Agile Methods Benefits of Agile Methods Costs of Traditional Methods Costs of Agile Methods** Value of Agile Methods Comparison of Agile Methods **Summary of Business Value** 

# **Productivity of Agile Methods**

PP productivity 32X more than trad. methods
 Scrum productivity 5X more than trad. methods
 Agile methods productivity 20X more than traditional



Rico, D. F., Sayani, H. H., & Sone, S. (2009). The business value of agile software methods. Ft. Lauderdale, FL: J. Ross Publishing.

# **Quality of Agile Methods**

XP quality 13X better than trad. methods
 Scrum quality 3X better than trad. methods
 Agile methods quality 5X better than traditional



Rico, D. F., Sayani, H. H., & Sone, S. (2009). The business value of agile software methods. Ft. Lauderdale, FL: J. Ross Publishing.

# **Costs of Agile Methods**

XP costs 8X less than traditional methods
 Scrum costs 2X less than traditional methods
 Agile methods cost 5X less than traditional methods



Rico, D. F., Sayani, H. H., & Sone, S. (2009). The business value of agile software methods. Ft. Lauderdale, FL: J. Ross Publishing.

# **Benefits of Agile Methods**

XP benefits 1.5X more than traditional methods
 Scrum benefits 1.3X more than traditional methods
 Agile methods benefits 1.4X more than trad. methods



Rico, D. F., Sayani, H. H., & Sone, S. (2009). The business value of agile software methods. Ft. Lauderdale, FL: J. Ross Publishing.

# **ROI of Agile Methods**

XP ROI 18X more than traditional methods
 Scrum ROI 3.4X more than traditional methods
 Agile methods ROI 10X more than trad. methods



Rico, D. F., Sayani, H. H., & Sone, S. (2009). The business value of agile software methods. Ft. Lauderdale, FL: J. Ross Publishing.

# **NPV of Agile Methods**

XP NPV 2.4X more than traditional methods
 Scrum NPV 1.9X more than traditional methods
 Agile methods NPV 2.3X more than trad. methods



# **Real Options of Agile Methods**

XP ROA 1.6X more than traditional methods
 Scrum ROA 1.4X more than traditional methods
 Agile methods ROA 1.6X more than trad. methods



Rico, D. F., Sayani, H. H., & Sone, S. (2009). The business value of agile software methods. Ft. Lauderdale, FL: J. Ross Publishing.

## Agenda

**Introduction to Agile Methods Types of Agile Methods Practices of Agile Methods Benefits of Agile Methods Costs of Traditional Methods Costs of Agile Methods** Value of Agile Methods **Comparison of Agile Methods** Summary of Business Value

# **Cost of Quality**

Apply traditional reliability and quality theory
 Defects are inexpensive to remove early in cycle
 Late bug removal has negative, multiplicative effect



Rico, D. F. (2000). Using cost benefit analyses to develop software process improvement (SPI) strategies. Rome, NY: DACS.

# **Real Options**

NPV models losses of Traditional Methods
 Real options model profits from Agile Methods
 Agile Methods incur less initial risk and higher ROI



Fichman, R. G., Keil, M., & Tiwana, A. (2005). Beyond valuation: Options thinking in IT project management. California Management Review, 47(2), 74-96.

# **Issues with Agile Methods**

Agile methods are small (but not simple)
 Agile methods more about values than practices
 Agile methods focus a lot on computer programming

Fundamentals	<ul> <li>Training</li> <li>Coaching</li> <li>User Stories</li> <li>Sprint and Release Planning</li> <li>Execution and Follow-Through</li> </ul>	User Experience Design	<ul> <li>Code Quality</li> <li>Code Reliability</li> <li>Usability</li> <li>Trust</li> <li>Overall User Experience</li> </ul>
Values	<ul> <li>Customer Collaboration</li> <li>High-Performance Teams</li> <li>Focus on Working Iterations</li> <li>Flexibility-Adaptability to Change</li> <li>Flexible-Adaptable Technologies</li> </ul>	Software Security	<ul> <li>Security Requirements</li> <li>Threat Modeling</li> <li>Security Architecture</li> <li>Code Analysis</li> <li>Vulnerability Testing</li> </ul>
Requirements Management	<ul> <li>Requirements Decomposition</li> <li>Requirements Collaboration</li> <li>Requirements Risk Analysis</li> <li>Requirements Business Value</li> <li>Requirements Prioritization</li> </ul>	Systems Engineering	<ul> <li>Project management</li> <li>Requirements</li> <li>Architecture</li> <li>Design</li> <li>Construction</li> </ul>

# **Trends in Agile Methods**

Agile methods are related to Lean Thinking
 Agile methods scale up to large projects/systems
 Agile methods now used in large US gov't programs

Lean Thinking	<ul> <li>Respect for People and Kaizen</li> <li>Reduction of Batch Size</li> <li>Reduction of Work in Process</li> <li>Reduction of Waste</li> <li>Pull versus Push, Kanban, Jidoka</li> </ul>	Outsourcing and Offshoring	<ul> <li>Culture</li> <li>Language</li> <li>Time zone</li> <li>Infrastructure</li> <li>Workforce</li> </ul>
Scalability	<ul> <li>Multi-Level Governance</li> <li>Multi-Level Planning</li> <li>Multi-Level Teams</li> <li>Multi-Level Backlogs</li> <li>Multi-Level Sprints or Iterations</li> </ul>	Change Management	<ul> <li>Exponential Rate of Change</li> <li>Coping with Large Changes</li> <li>Use of Incremental Change</li> <li>Planning for Change</li> <li>Agile Organizations</li> </ul>
Virtual Distributed Teams	<ul> <li>Clear Vision, Mission, Strategy</li> <li>Clear Goals and Objectives</li> <li>Clear Timelines and Expectations</li> <li>Periodic Face-to-Face Meetings</li> <li>Synchronous/Asynchronous Tools</li> </ul>	Agile Acquisition	<ul> <li>Agile Acquisition Policies</li> <li>Agile Acquisition Standards</li> <li>Agile Acquisition Contracting</li> <li>Agile Acquisition Reporting</li> <li>Agile Acquisition Training</li> </ul>

# **New Book on Agile Methods**

Guide to Agile Methods for business leaders
 Communicates business value of Agile Methods
 Rosetta stone to Agile Methods for Traditional folks

#### THE BUSINESS VALUE OF AGILE SOFTWARE METHODS

MAXIMIZING ROI WITH JUST-IN-TIME PROCESSES AND DOCUMENTATION



Dr. David F. Rico Dr. Hasan H. Sayani Dr. Saya Sone

Foreword by Dr. Jeffrey V. Sutherland

#### **Table of Contents**

1. Introduction to Agile Methods 2. Values of Agile Methods History of Agile Methods 4. Antecedents of Agile Methods 5. Types of Agile Methods 6. Practices of Agile Methods 7. Agile Project Management 8. Agile Software Engineering Agile Support Processes 10. Agile Tools and Technologies 11. Comparison of Agile Methods 12. Agile Metrics and Models 13. Surveys of Agile Methods 14. Costs-Benefits of Agile Methods 15. ROI Metrics of Agile Methods Measures of Agile Methods 17. Costs of Agile Methods 18. Benefits of Agile Methods 19. ROI of Agile Methods 20. NPV of Agile Methods 21. Real Options of Agile Methods 22. Business Value of Agile Methods 23. Agile vs. Traditional Methods 24. Future of Agile Methods







<u>http://davidfrico.com/rico09b.pdf</u> (*ROI tutorial*)
 <u>http://davidfrico.com/rico09e.pdf</u> (*ROI survey*)
 <u>http://davidfrico.com/rico09g.xls</u> (*ROI database*)