

ICIM 2008 - International Conference on Innovation and Management

***Adopting Agile Software Project Management  
Practices: Success Factors , Changes  
Required, and Challenges***

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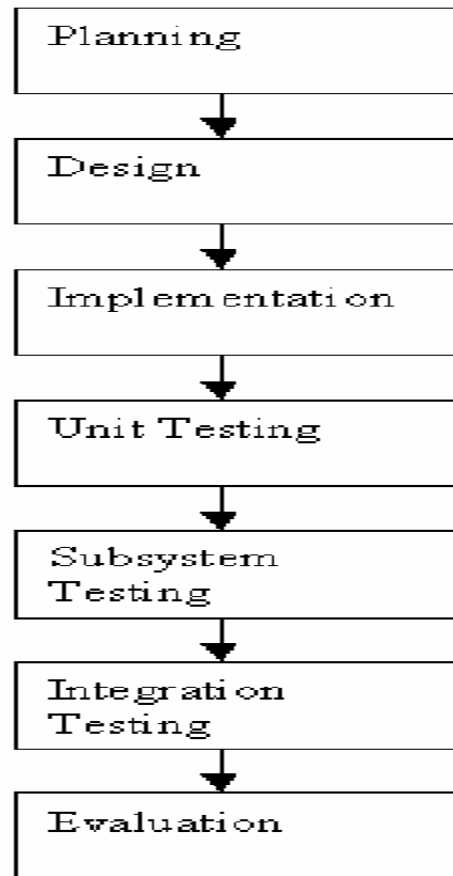
# *History and Evolution*

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- Heavily Process Based
  - Code-and-fix method
  - Stage-wise method
  - Waterfall method
  - ...
  - ...
  - Spiral method
- Less Emphasis on Process
  - Agile Software Development

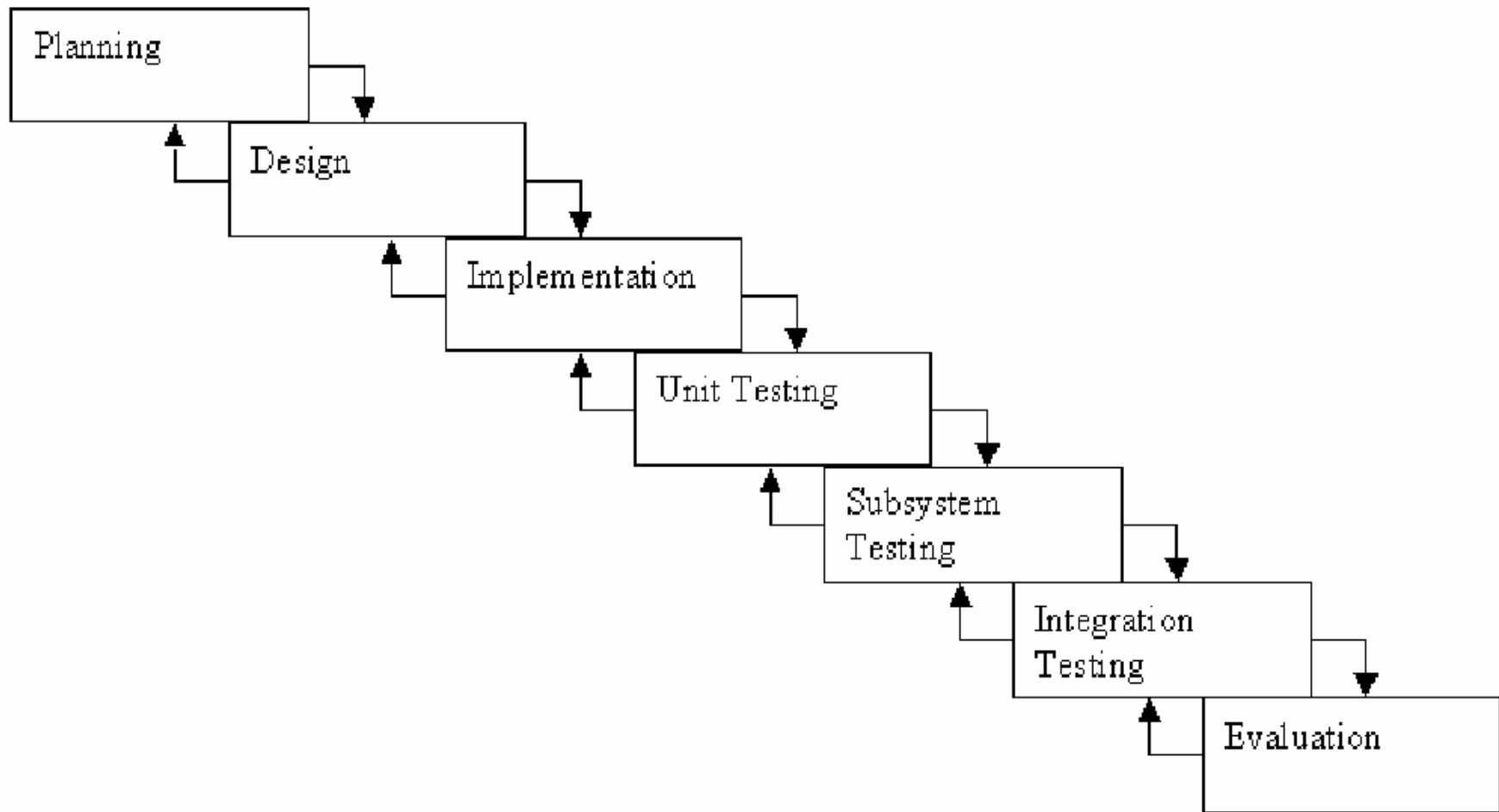
# Stage-wise Model

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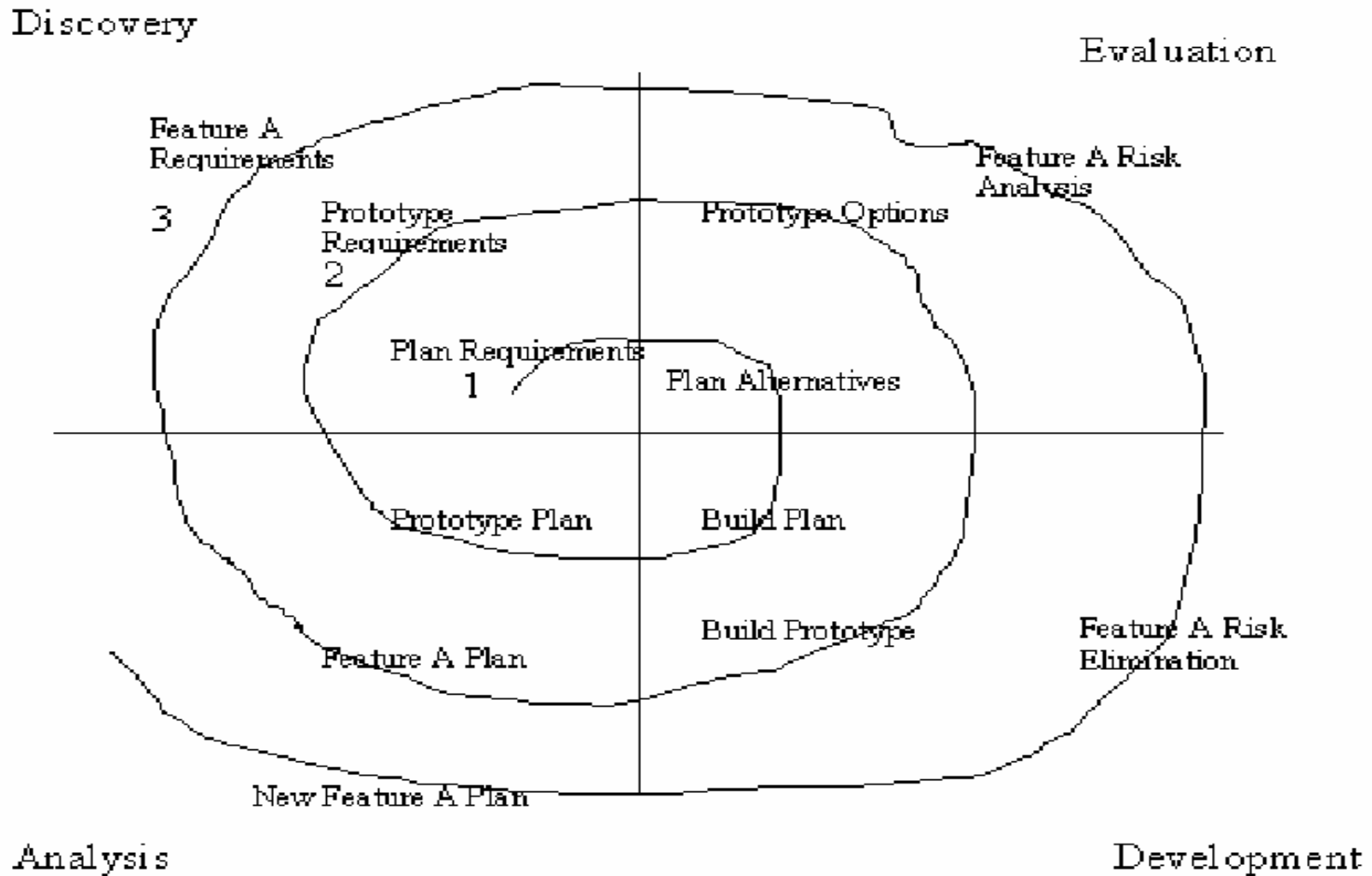


# Waterfall Model

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# Spiral Model



# Small releases

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Source: <http://www.stanford.edu/class/cs193d/handouts/15-xp.pdf>

- Developing software difficult to predict
- Customers prefer pieces of software incrementally in shorter time scales
- Possibility of missing deadlines is less
- Easier to respond to new requirements

# Agile Software Project Management

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- Emerging discipline.
- Initially proposed and promoted by a group of seventeen software professionals who practice a set of “lightweight” methods, and share a common set of values of software development.
- They consolidated their thoughts, and defined these methods as “agile”.
- The *Manifesto for Agile Software Development* was released in early 2001.
- Gained importance among the software professionals primarily in the last few years.

# Agile Manifesto

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- *Individuals and interactions over processes and tools*
- *Working software over comprehensive documentation*
- *Customer collaboration over contract negotiation*
- *Responding to change over following a plan*

# Principles

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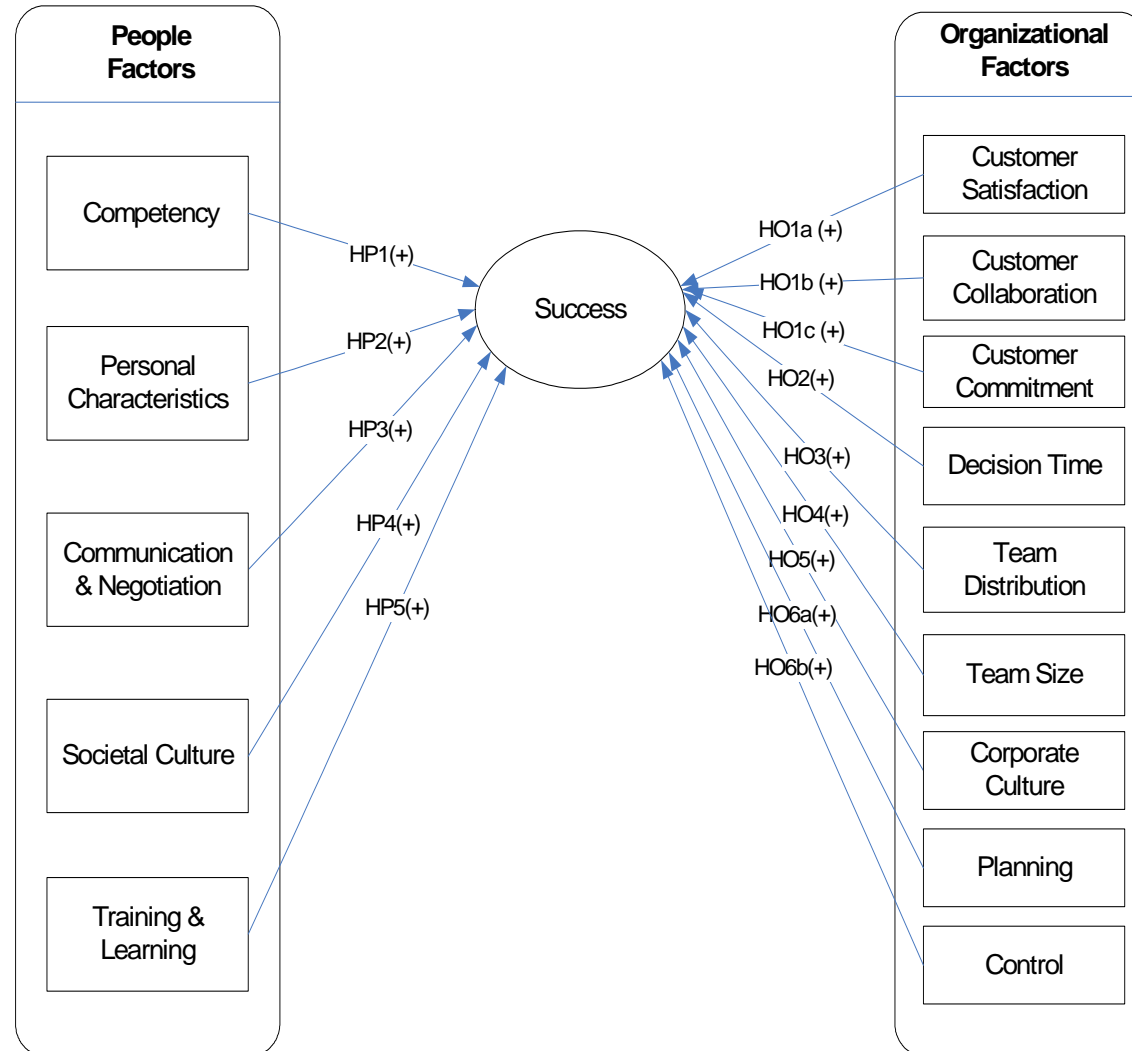
- *Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.*
- *Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.*
- *Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.*
- *Business people and developers must work together daily throughout the project.*
- *Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.*
- *The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.*
- *Working software is the primary measure of progress.*
- *Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.*
- *Continuous attention to technical excellence and good design enhances agility.*
- *Simplicity--the art of maximizing the amount of work not done--is essential.*
- *The best architectures, requirements, and designs emerge from self-organizing teams.*
- *At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.*

## Concerns

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- What are the factors that will influence the success of projects that want to adopt agile software practices?
- What are the important changes required for adopting agile software practices in projects practicing traditional plan-driven software development? Can we rank them according to their level of importance?
- What are the most important challenges/risks that projects may encounter for adopting agile software practices? Can we rank them according to their level of importance?

# Success Factors: A Conceptual Framework



# *Dependent Variable: Success*

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- Measures
  - Reduced delivery schedules
  - Increased return on investment (ROI)
  - Increased ability to meet with the current customer requirements
  - Increased flexibility to meet with the changing customer requirements
  - Improved business processes
- Consolidated Success Measure

## *What we did...*

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- **Phase I**
  - Identification of the concerns. Formulation of the research questions.
  - Construction of the theoretical frameworks.
  - Development of hypotheses based on the research questions.
- **Phase II**
  - Collection of data.
- **Phase III**
  - Analysis of the data collected as part of Phase II.

# *Methodology*

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- Research design
- Survey technique
- Questionnaire design
- Identifying the respondents
- Pre-testing the questionnaire

	<b>Identity</b>	<b>Response percent</b>
1	Computer related (IS/MIS/DP/Hardware/Software/Telecommunications)	32.5%
2	Banking/insurance	10.2%
3	Real estate	1.2%
4	Business supplies/services	1.2%
5	Education/research	5.1%
6	Entertainment/media/publishing	1.2%
7	Hospitality	0%
8	Medical/health care	2.4%
9	Government	2%
10	Engineering/construction	0.8%
11	Consulting	29.8%
12	Legal services	0%
13	Manufacturing/distribution	2%
14	Consumer retail/wholesale	0.8%
15	Non-profit/membership organization	0%
16	Electrical machines	0.4%
17	Aerospace	2.4%
18	Others	7.9%

	<b>Number of employees in respondents' organizations</b>	<b>Response percent</b>
1	Less than 10	11.8%
2	10-20	5.9%
3	21-40	9.8%
4	41-100	7.9%
5	101-500	10.2%
6	501-1000	27.6%
7	Greater than 1000	26.8%

	<b>Number of employees in respondents' teams</b>	<b>Response percent</b>
1	Less than 5	19.4%
2	5-10	33.3%
3	11-20	26.2%
4	21-40	10.3%
5	Greater than 40	10.3%

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	<b>Role</b>	<b>Response percent</b>
1	Functional Manager	7.9%
2	Project Manager	17.7%
3	Team Leader	18.9%
4	Developer/Tester	29.5%
5	Other	26%

	<b>Duration developing software using ASD</b>	<b>Response percent</b>
1	Less than 1 year	19.6%
2	1-3 years	30%
3	3-5 years	26.4%
4	Greater than 5 years	24%

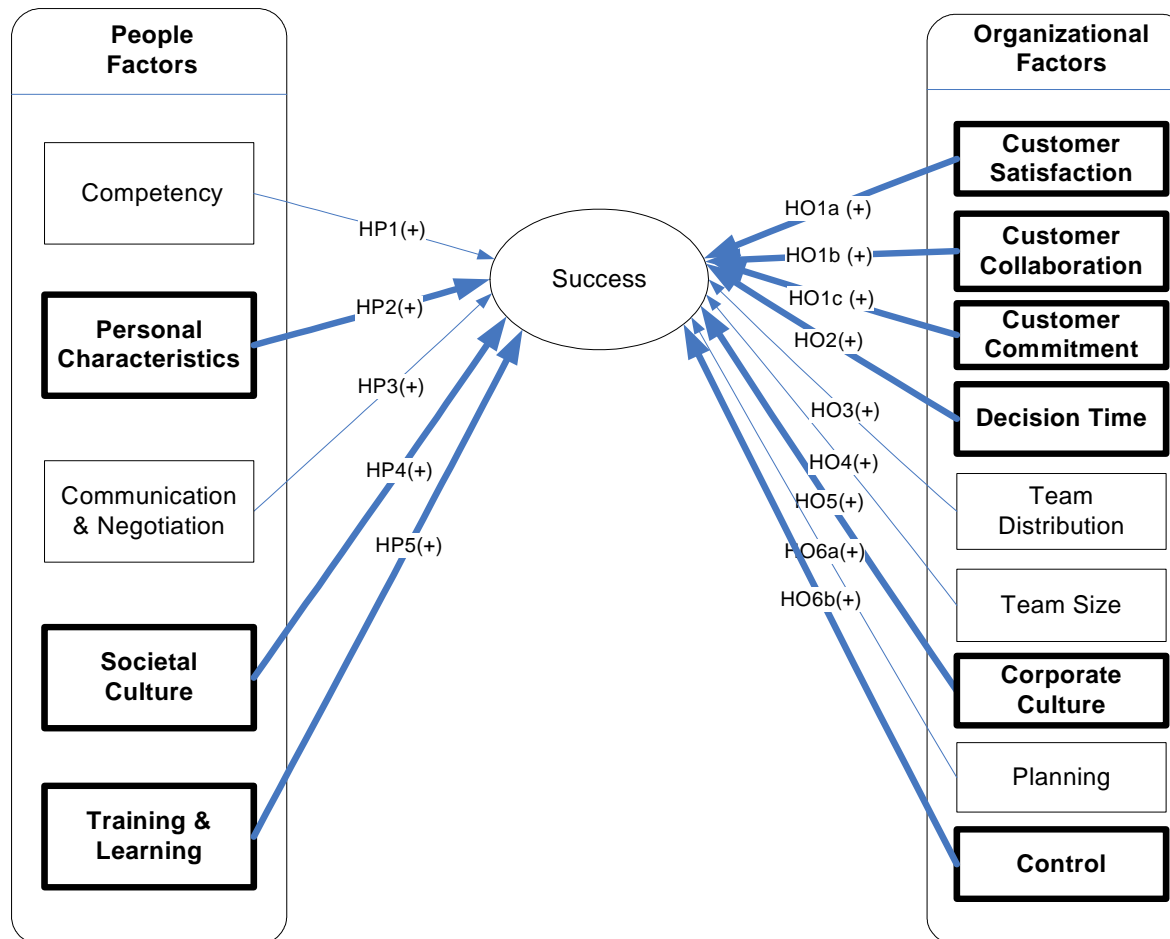
## Degree of practice of the Agile principles (snapshot only ...)

	<b>Strongly Disagree (1)</b>	<b>Somewhat Disagree (2)</b>	<b>Neither Disagree nor Agree (3)</b>	<b>Somewhat Agree (4)</b>	<b>Strongly Agree (5)</b>	<b>Not Applicable or Don't Know (X)</b>	<b>Response Average</b>
We give high priority to satisfying customers through early and continuous delivery of valuable software	2%	2%	5%	12%	77%	2%	4.63
We welcome changing requirements, even late during development	3%	7%	9%	37%	42%	2%	4.11
We deliver working software more frequently, from couple of weeks to couple of months, with a preference to a shorter timescale	3%	2%	5%	19%	69%	2%	4.52
Our business people and developers work together daily (very closely) throughout the project	4%	10%	6%	29%	49%	2%	4.12
We build projects around motivated individuals. We give them the environment and trust them to get the job done.	2%	6%	8%	31%	51%	2%	4.24
We emphasize more on face-to-face communication for conveying information to and within the development team.	1%	3%	8%	23%	63%	2%	4.46

# Data Analysis: Success Factors

Variables	Correlation coefficient	Significance
Ind1 (Customer Satisfaction)	.140	.036
Ind2 (Customer Collaboration)	.232	.001
Ind3 (Customer Commitment)	.253	.001
Ind4 (Decision Time)	.254	.000
Ind5 (Team Distribution)	.074	.171
Ind6 (Team Size)	.097	.107
Ind7 (Corporate Culture)	.241	.001
Ind8 (Planning)	.075	.168
Ind9 (Control)	.301	.000
Ind10 (Technical Competency)	.102	.096
Ind11 (Personal Characteristics)	.180	.010
Ind12 (Communication & Negotiation)	.104	.092
Ind13 (Societal Culture)	.381	.000
Ind14 (Training & Learning)	.283	.000

# Revised Success Factors Framework



## ***Linear Multiple Regression***

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$$\ln(\text{Success}) = 0.940 + 0.044(\text{Ind 13}) + 0.031(\text{Ind 3}) \\ + 0.020(\text{Ind 9}) + 0.037(\text{Ind 14})$$

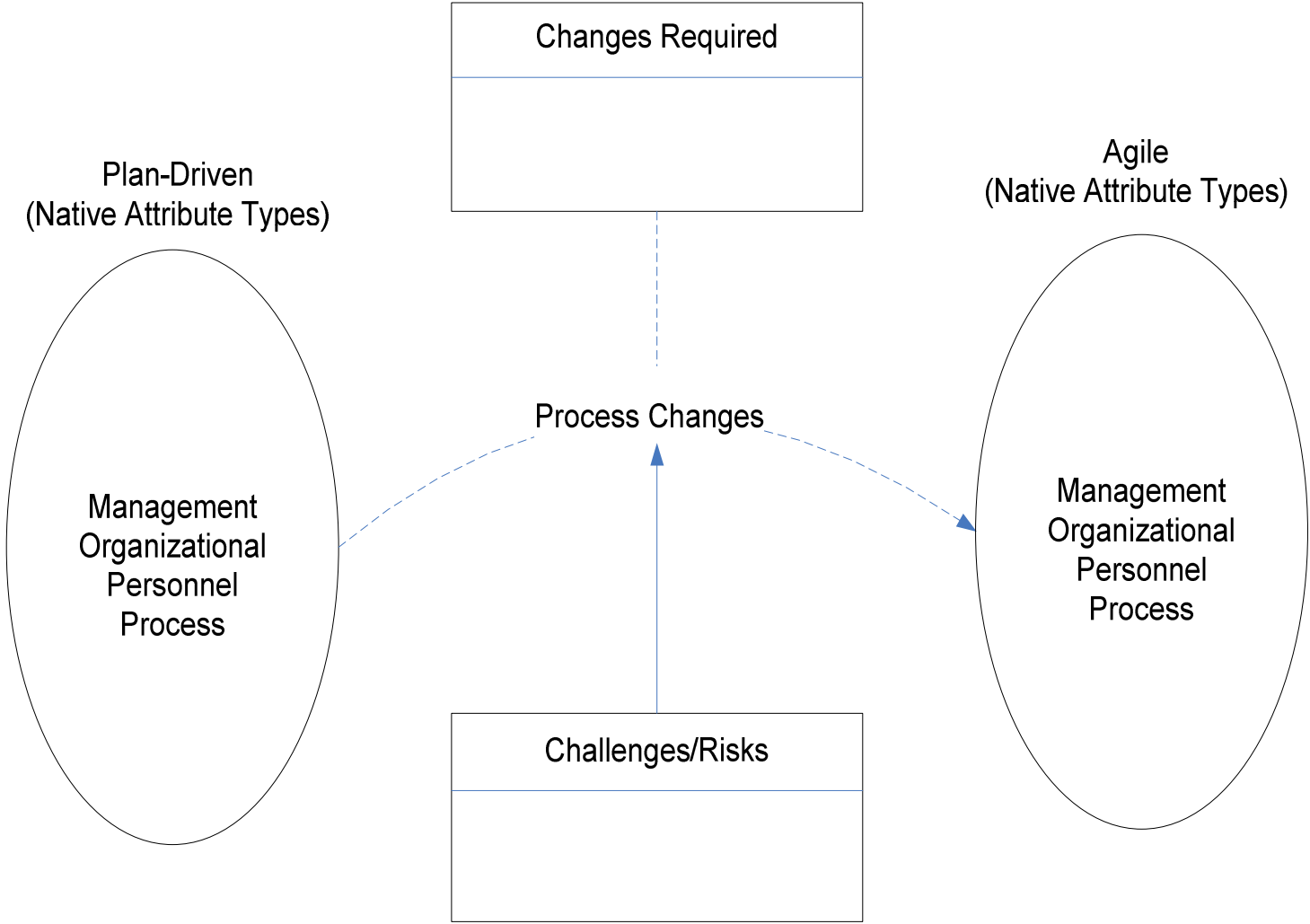
- **Ind 3 → Customer Commitment**
- **Ind 9 → Control**
- **Ind 13 → Societal Culture**
- **Ind 14 → Training and Learning**

# Linear Multiple Regression

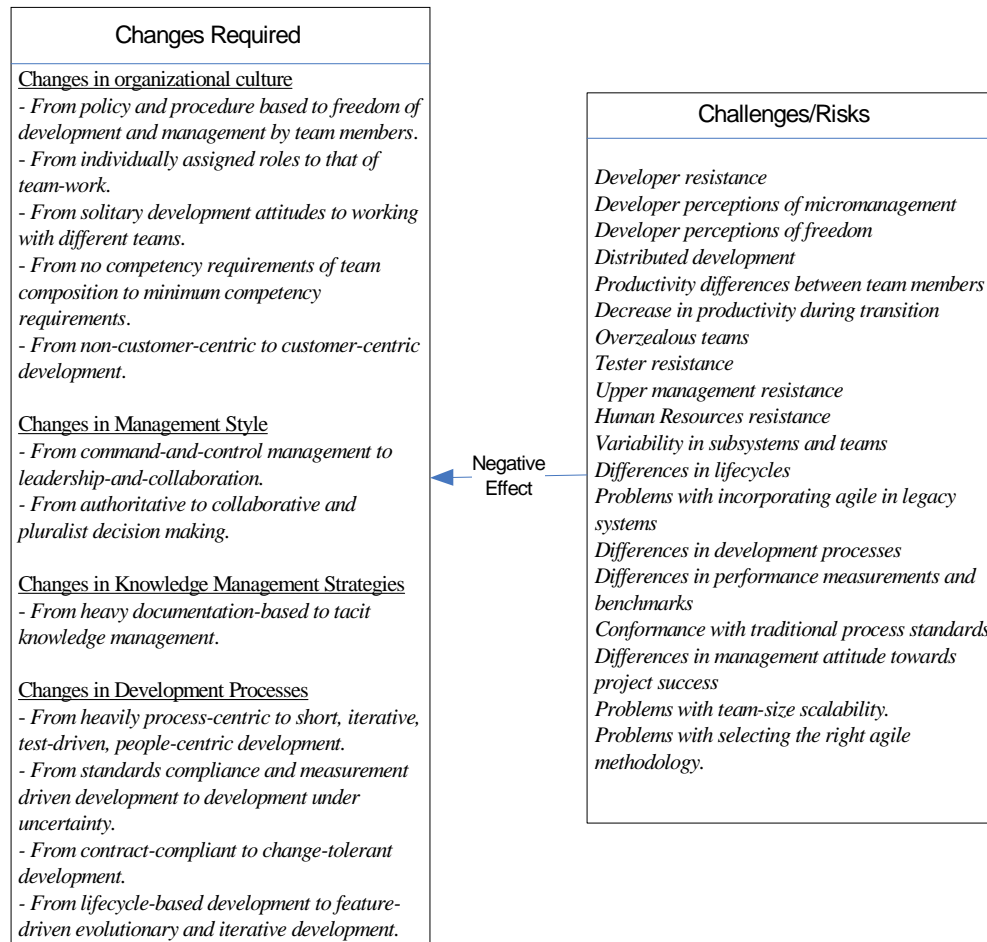
Reduced delivery schedules.	D1	Customer Collaboration	Ind2
Increased return on investment (ROI).	D2	Customer Commitment	Ind3
Increased ability to meet with the current customer requirements.	D3	Decision Time	Ind4
Increased flexibility to meet with the changing customer requirements.	D4	Corporate culture	Ind7
Improved business processes.	D5	Control	Ind9
		Societal Culture	Ind13
		Training and Learning	Ind14

	Predictors	Regression Model
1	Ind13, Ind14	$D1 = 2.343 + .255 (\text{Ind13}) + .197 (\text{Ind14})$
2	Ind14, Ind9, Ind2	$\text{Log } (D2) = .626 + .098 (\text{Ind14}) + .048 (\text{Ind9}) + .052 (\text{Ind2})$
3	Ind3, Ind7	$\text{Log } (D3) = 1.232 + .036 (\text{Ind3}) + .038 (\text{Ind7})$
4	Ind3	$D4 = 4.24 + .013 (\text{Ind3})$
5	Ind4, Ind7, Ind3	$\text{Log } (D5) = .722 + .079 (\text{Ind4}) + .052 (\text{Ind7}) + .033 (\text{Ind3})$

# Transitioning Traditional Software Project Management Practices into Agile



# The changes required for adopting agile practices in plan-driven projects, and the associated challenges/risks



# Data Analysis: Changes

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Rank	Variables	N	Mean	Std. Deviation
1	C2	165	4.35	1.01
2	C1	165	4.19	0.90
3	C4	165	4.19	0.93
4	C3	165	3.86	1.18

## *Definitions of Variables*

Changes in organizational culture (From Plan Driven to Agile)	C1
Changes in management style (From Plan Driven to Agile)	C2
Changes in knowledge management strategy (From Plan Driven to Agile)	C3
Changes in development processes (From Plan Driven to Agile)	C4

## *t*-test results: Critical Changes

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- One sample t-test
  - All change items are significantly *different* from 3 (“Neutral”)
- Pair-wise t-test
  - C1 (changes in organizational culture) and C4 (changes in development processes) *do not have* statistically different mean values
- Discussion
  - **Most critical change:** *Changes in management style*
  - **Remaining significant changes:** *Change in organizational culture, Change in development process, and Changes in knowledge management strategies*
  - **Similar level of importance:** *Change in organizational culture, and Change in development process*

# Data Analysis: Changes

Rank	Variables	N	Mean	Std. Deviation
<b>C1 (Changes in organizational culture)</b>				
1	C1.3	165	4.56	0.93
2	C1.5	165	4.38	1.13
3	C1.2	165	4.25	1.08
4	C1.1	165	4.04	1.32
5	C1.4	165	3.74	1.38
<b>C2 (Changes in management style)</b>				
1	C2.1	165	4.46	1.11
2	C2.2	164	4.23	1.11
<b>C3 (Changes in knowledge management strategy)</b>				
1	C3	165	3.86	1.18
<b>C4 (Changes in development processes)</b>				
1	C4.1	165	4.61	1.02
2	C4.4	165	4.39	1.05
3	C4.3	165	4.12	1.31
4	C4.2	164	3.64	1.36

## ***t-test results: Critical Sub-changes***

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- One sample t-test
  - All passed t test: all sub-items are significant
- Pair-wise t-test
  - Changes in organizational culture:
    - Following sub-changes are of equal importance
      - From non-customer centric to customer centric
      - From individually assigned roles to that of team work
  - Rest all are ranked

# Data Analysis: Challenges

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Rank	Variables	N	Mean	Std. Deviation
1	Chal9	161	4.10	1.46
2	Chal1	161	3.81	1.24
3	Chal4	161	3.72	1.36
4	Chal12	159	3.62	1.41
5	Chal11	161	3.57	1.49
6	Chal17	161	3.52	1.34
7	Chal7	161	3.50	1.23
8	Chal15	161	3.38	1.41
9	Chal13	159	3.33	1.40
10	Chal14	161	3.31	1.47
11	Chal2	160	3.26	1.40
12	Chal19	156	3.18	1.38
13	Chal3	159	3.13	1.41
14	Chal18	159	3.09	1.42
15	Chal8	161	3.09	1.59
16	Chal5	161	3.05	1.16
17	Chal6	161	2.96	1.20
18	Chal10	161	2.84	1.60
19	Chal16	161	2.83	1.67

## ***t-test results: Critical Challenges***

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- One sample t-test
  - 11 challenge items are significantly different from “3” (Neutral)
  - 8 challenge items are not significantly different from “3”
- Pair wise t-test
  - Only Chal1 (Resistance from developers) and Chal9 (Upper management resistance) have statistically different mean values
  - Rest all pairs do not have statistically different mean values
- Discussion
  - Upper management resistance is the most critical challenge
  - Remaining challenges are similar

# ***Additional Success Factors, Changes, and Challenges***

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- **Additional Success Factors:**
  - Learning from failure
  - Timing issues
  - Other team characteristics
  - Use of tools
- **Additional Changes:**
  - Changes in customer attitude
  - Changes in personal characteristics
- **Additional Challenges:**
  - No significant challenge categories identified

# Conclusions

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- Opportunities: Glittering
- Challenges:
  - Several crucial
  - Not a “ready-made” solution.
- Need a balance
  - Identify the home-grounds where plan-driven and agile fit respectively.
- Concerns of importance:
  - success factors
  - changes
  - challenges.
- Research in Progress ...