Experiences of Software Process Modelling

Invited talk given to the Software Reliability and Metrics Club

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Keith Phalp

K.Phalp@ecs.soton.ac.uk

CORE
Bournemouth University Research Online
Metadata, citation and similar papers at co

Modelling - An Agenda

* A multitude of representation schemes but little to guide the practitioner.

* Need to consider environment and organizational goals.

* Need to incorporate measurement.

* Need for reported experience (case studies) within 'real' organizations.

Pilot Study

AIMS

* Produce preliminary models of the launch procedures and process.
* Identify discrepancies between the documented and the actual process.
* Discover, problems with current process (procedures).

METHOD

1)Goal-based strategy.

2) Low cost, low impact approach.

3) Phased Models

Later developed to form the GUIDE method.

Instance Models

1) Pilot study models of actual process were based on a mishmash of several projects.

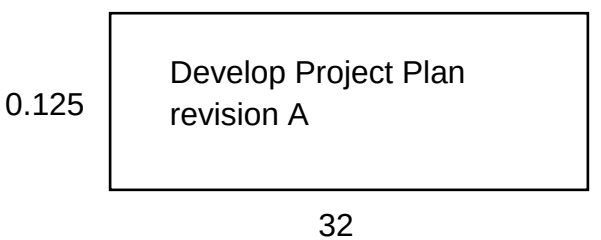
2) Interesting questions centred on how specific projects deviated from process descriptions.

3) A model based on many projects is in danger of only ever modelling the 'lowest common denominator'.

Extended DFD Notation

* Used to describe software projects.

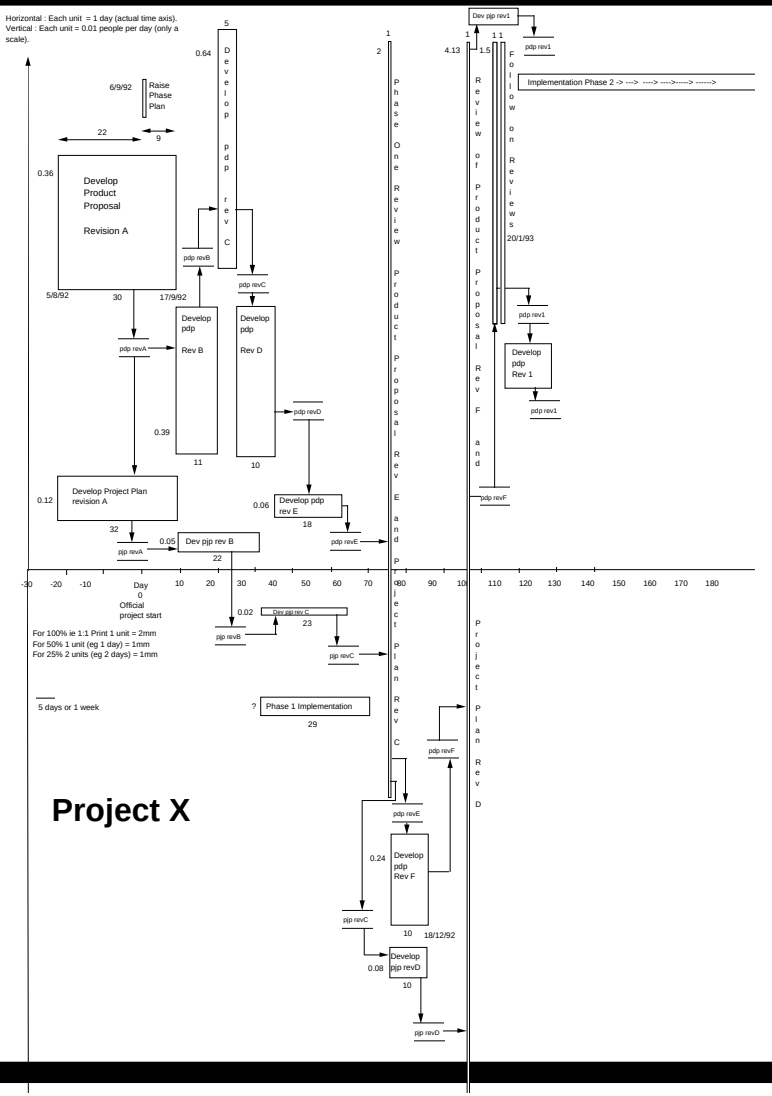
This shows one activity from project X.



This activity took 32 days.

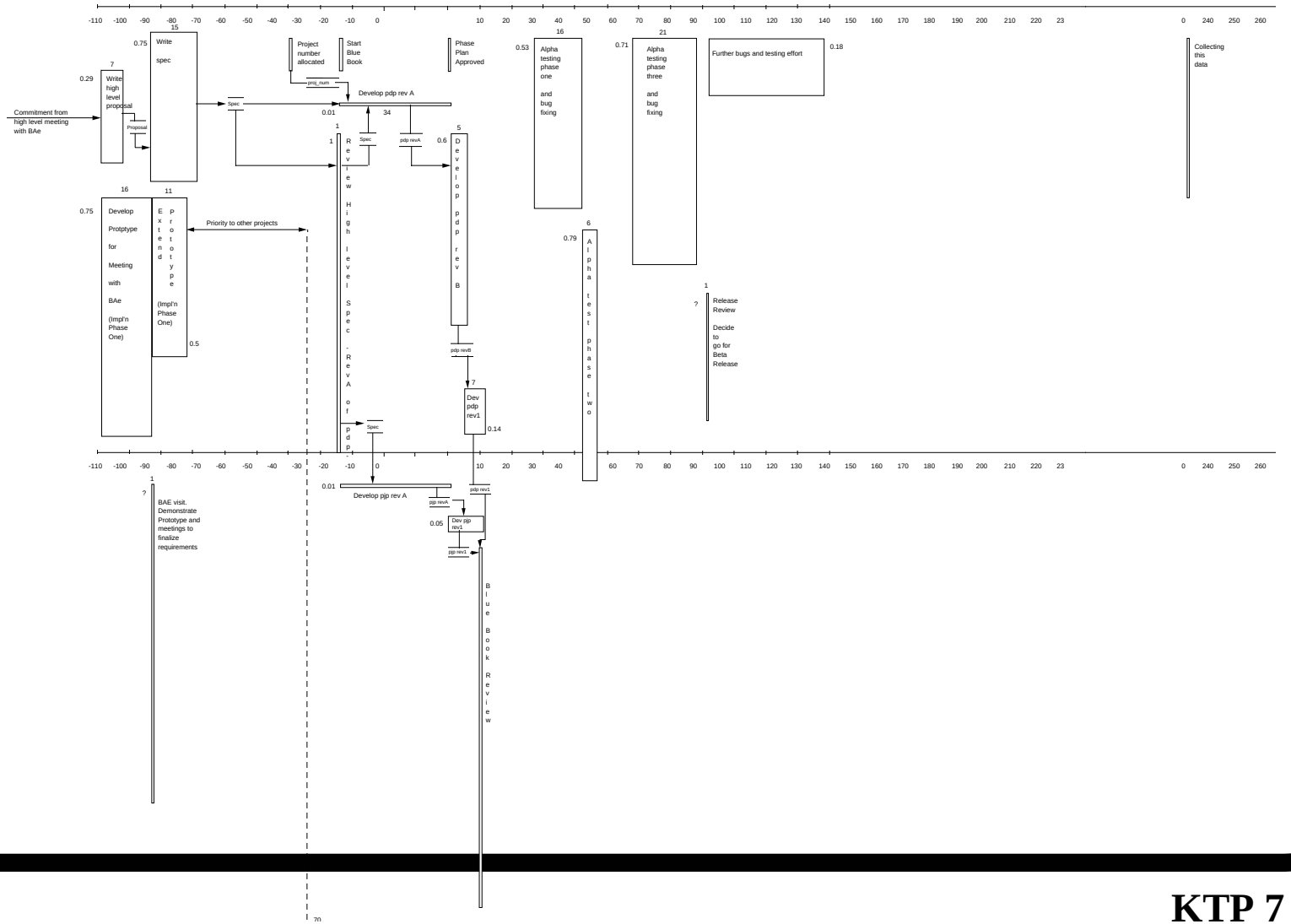
The effort expended was 32 * 0.125 = 4 man days

Project X


Horizontal : Each unit = 1 day (actual time axis).
Vertical : Each unit = 0.01 people per day (only a scale).
Develop pdp rev C
Phase One Review Product Proposal Review and Project Plan Rev C
Review of Product Proposal Rev F and Follow on Reviews 20/1/93
Project Plan Rev D
6/9/92
Raise Phase Plan
22
9
0.36
Develop Product Proposal
Revision A
5/8/92
30
17/9/92
pdp revA
pdp revB
pdp revC
pdp revD
pdp revE
pdp revF
pdp rev1
Develop pdp Rev B
11
Develop pdp Rev D
10
0.39
0.12
Develop Project Plan revision A
32
pjp revA
0.05
Dev pjp rev B
22
0.06
Develop pdp rev E
18
0.02
Dev pjp rev C
23
pjp revB
pjp revC
Phase 1 Implementation
29
?
5 days or 1 week
For 100% ie 1:1 Print 1 unit = 2mm
For 50% 1 unit (eg 1 day) = 1mm
For 25% 2 units (eg 2 days) = 1mm
Day 0 Official project start
-30 -20 -10 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Dev pjp rev1
4.13
1.5
Implementation Phase 2 -> ----> ----> ----> ------> ------>
Develop pdp Rev 1
0.24
Develop pdp Rev F
18/12/92
0.08
Develop pjp revD
pjp revD
Project X

Project Y

PROJECT Y



Project Success

Characteristic	V	W	X	Y	Z	Median Response
Budget	5	8	8	1	8	8
Customer satisfaction	7	6	7	2	8	7
Forced changes to design	2	5	7	2	6	5
Keeping to specification	4	10	8	9	10	9
Management of Risks	6	5	6	4	7	6
Panics	8	7	7	7	5	7
Post-integration bugs	3	9	7	1	9	7
Re-work	3	7	7	1	8	7
Requirements problems	5	10	9	9	5	9
Within schedule	5	2	7	7	8	7
Unexpected problems	3	7	7	2	7	7
Unplanned over-time	3	10	5	5	3	5
Median Score	4.5	7	7	3	7.5	7

Analysis

Significant positive relationship between percentage of time on first revision of product proposal and:

* Remaining within budget
* Minimizing post integration defects
* Minimizing unplanned changes
* Management of risks
* User Satisfaction
* Minimizing project rework

Project Factors	Overall Project Success
% Project Effort spent on first version of product proposal	0.9747 sig .142
% Project Effort on Project Planning	0.6669 sig .109
% Effort prior to official project start	-0.513 sig .467

Implications

1) Software development still not well understood.

2) Huge variety in processes carried out by software projects (even with a defined process)

   –a) Suggests different types of projects even in one organization, and implies much greater variety across different sites or different organizations.

   –b) Suggests that enaction will be difficult to achieve.

3) Need for process guidance.

4) Variety in software projects makes (quantitative) data analysis very difficult.

5) Process modelling and software measurement have complementary roles.

More Implications

6) Having generic process can aid data collection.

7) Need for pragmatic approaches to process modelling.

8) Need for goal-based approaches to process modelling.

9) Greater Emphasis needed on Industrial and Empirical Process Modelling Work.

10) Industrial Needs Inevitably Compromise Experimental Ideals.

Lessons Learned 1

* Concentrate on the goals and characteristics of the organization.

  Start by letting the organization suggest the problem or opportunity.

  Choose a feasible goal.
* Have a champion of your cause within the organization.
* Don't criticize any individuals: simply assess the process.
* It is a huge benefit to be seen as independent.
* Explain what you are doing and why.
* Be honest. Confess your ignorance.
* Make the organization take decisions.
* Get process users involved in discussion about the process.
* Be prepared to be flexible. Many people have tremendous demands on their time. You may not always be the highest priority.

Lessons Learned 2

* Decide what measures need to be collected, what this will tell you, and how it will be used, and then and only then try to find out how this data can be made available.
* Try to avoid the time-period between interviews being compressed through problems with staff availability or time-pressure.
* If the process model is a collection framework, then you must know how well projects conform to that model before it can be used in this way.
* Be consistently available or on-site so that people know how and where to contact you.
* Don't be afraid to abandon a strategy, and admit to its failings.
* Be persistent.

GUIDE

Goal: To understand (passive purpose) the launch process (object) at site X (environment) from the view point (perspective) of the actors in that process.

Use: Senior managers and other actors in the process (audience) will use the models in order to enhance their understanding (use1) of the existing process, to aid discussion of it (use2) , and to suggest and communicate (use3) improvements. The model will be used by a guide for enaction by people. There is no need for an enactable model (enaction).

Investment: The initial modelling pilot is allowed only five person days (effort). There will be no additional funding for automated support (other resource) .

Deliverables: Model of procedures(d1). Models of actual process(d2). Report(d3) and presentation(d4) on discrepancies between procedures and reality.

Experience/Environment : Existing procedures focus on activities and products. The engineers and managers are comfortable with procedural notations.

Further Observations

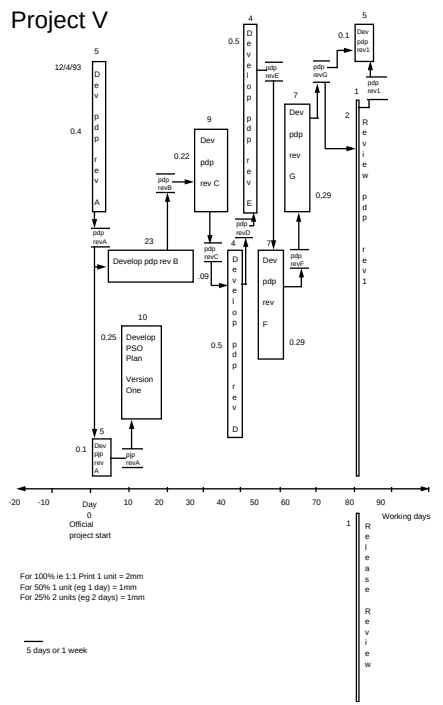
1) Its not using models or describing processes that's the hard bit, it's **figuring out what the process is in the first place**.

2) Easy to get drawn into organizational rather than research goals.

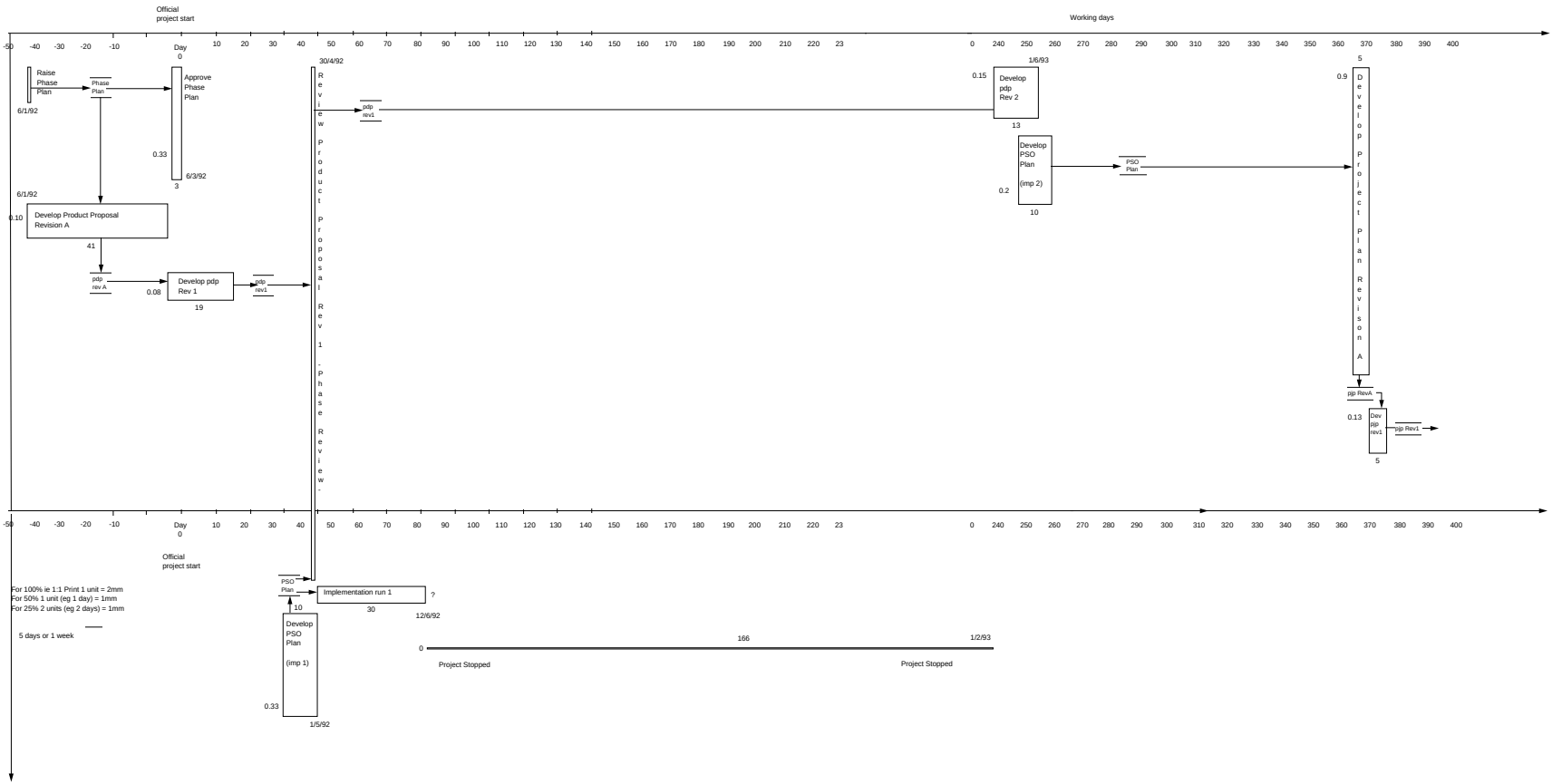
3) Practical and people problems are as important and time-consuming as technical ones (if not more-so).

Project V

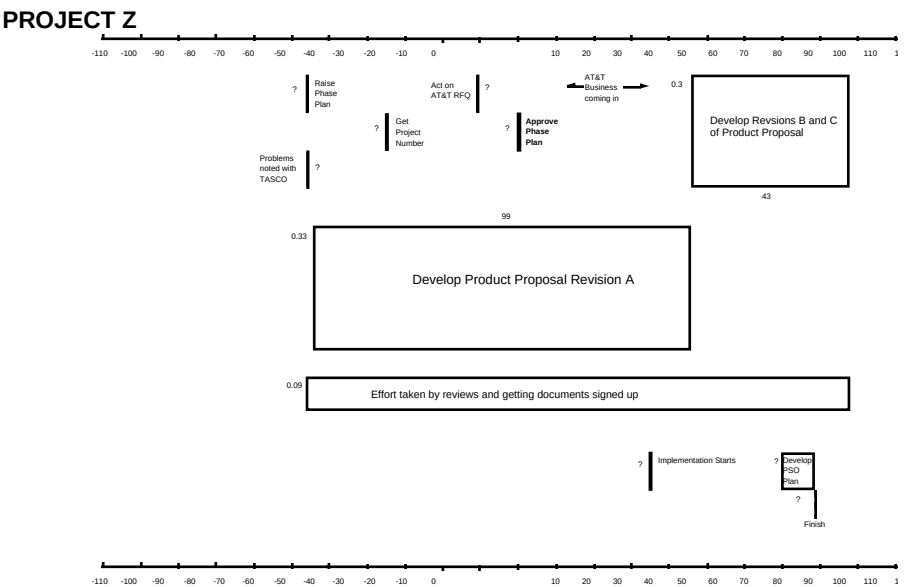
Horizontal : Each unit = 1 day (actual time axis).
Vertical : Each unit = 0.01 people per day (only a scale).



Project W


Official project start
Working days
Day 0
Raise Phase Plan
6/1/92
Phase Plan
Approve Phase Plan
0.33
6/3/92
3
6/1/92
0.10
Develop Product Proposal Revision A
41
pdp rev A
0.08
Develop pdp Rev 1
19
pdp rev1
Review Product Proposal Rev 1 - phase Review -
30/4/92
pdp rev1
1/6/93
0.15
Develop pdp Rev 2
13
Develop PSO Plan (imp 2)
0.2
10
PSO Plan
5
0.9
Develop Project Plan Revision A
pjp RevA
0.13
Dev pjp rev1
5
pjp Rev1
Official project start
PSO Plan
10
Develop PSO Plan (imp 1)
0.33
1/5/92
Implementation run 1
30
?
12/6/92
0
166
1/2/93
Project Stopped
Project Stopped
For 100% ie 1:1 Print 1 unit = 2mm
For 50% 1 unit (eg 1 day) = 1mm
For 25% 2 units (eg 2 days) = 1mm
5 days or 1 week

Project Z


PROJECT Z
-110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110
?
Raise Phase Plan
Act on AT&T RFQ
?
AT&T Business coming in
0.3
Develop Revsions B and C of Product Proposal
43
?
Get Project Number
?
Approve Phase Plan
Problems noted with TASCO
?
99
0.33
Develop Product Proposal Revision A
0.09
Effort taken by reviews and getting documents signed up
?
Implementation Starts
?
Develop SO Plan
?
Finish
-110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110

Collection Mechanism

Selection of activities from project X

Activity Name	Start	Finish	Duration	Effort	Usage
Develop pdp rev A	5/8/92	17/9/92	31	11.25	0.36
Develop pdp rev B	17/9/92	2/10/92	11	4.25	0.39
Develop pdp rev C	2/10/92	9/10/92	5	3.19	0.64
Phase One Review	4/12/92	4/12/92	1	2.00	2.00
Follow on reviews	20/1/93	20/1/93	1	1.50	1.50
Develop pdp rev 1	20/1/93	8/2/93	13	1.50	0.12
Develop PSO plan	17/9/93	18/12/93	66	0.50	0.01
Develop pjp rev A	5/8/92	18/9/92	32	3.75	0.12
Develop pjp rev 1	8/1/93	27/1/93	13	0.50	0.04

See template for all 155 activities & codes

Correlations with Means

	Measures	Projects					
		V	W	X	Y	Z	
1	% effort on product proposal A	7.39	18.18	25.16	0.20	30.09	Percent
2	% effort on project plan	1.85	20.45	8.39	0.20	6.02	Percent
3	Implementation start - Product Proposal A finish		45.00	23.00	-110.00	-11.00	Days
4	Raw launch activity effort before day 0	3.49	5.30	10.70	28.00	22.71	Days
5	All effort expended before day 0				114.50		Days
	Total launch activity effort	27.06	22.00	44.72	33.63	108.00	
6	% of launch activities effort expended before day 0.	12.90	24.09	23.93	83.27	21.02	Percent
	Total of all launch period effort				127.38		Percent
7	% of launch period effort expended before day 0.				89.89		Percent
	SELECTED SCORES FROM SUCCESS FACTORS	V	W	X	Y	Z	
1	Mean Success score	4.50	7.17	7.08	4.08	7.08	
2	Customer Satisfaction	7.00	6.00	7.00	2.00	8.00	
3	Budget	5.00	8.00	8.00	1.00	9.00	
4	Rework	3.00	7.00	7.00	1.00	7.00	
5	Schedule	5.00	2.00	7.00	7.00	8.00	
	EXAMPLE CORRELATIONS	**Correl**					
	% effort on pdp (M1) with Mean Success	0.92457		Significant at 5% level			
	% effort on pdp (M1) with Satisfaction	0.79307					
	% effort on pdp (M1) with Budget	0.94234		Significant at 5% level			
	% effort on pdp (M1) with Rework	0.93906		Significant at 5% level			
	% effort on pdp (M1) with Schedule	0.18333					
	% effort on project plan (M2) with Mean Success	0.74509					
	% effort on project plan (M2) with Satisfaction	0.28632					
	% effort on project plan (M2) with Budget	0.62603					
	% effort on project plan (M2) with Rework	0.72083					
	% effort on project plan (M2) with Schedule	-0.7285					
	% launch activity before day 0 (M6) with Mean Success	-0.56353					
	% launch activity before day 0 (M6) with Satisfaction	-0.95269		Significant at 5% level			
	% launch activity before day 0 (M6) with Budget	-0.81462					
	% launch activity before day 0 (M6) with Rework	-0.68609					
	% launch activity before day 0 (M6) with Schedule	0.26883					