

Hiking in a Fog

—

Scope Management of the Actual Software Requirements

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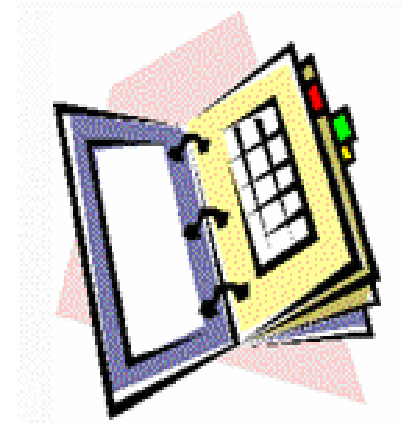
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Agenda

1. Introduction and Definitions
2. Role of FPA in Scope Management
3. As the Fog Lifts
4. Case Study Analysis
5. Key Points



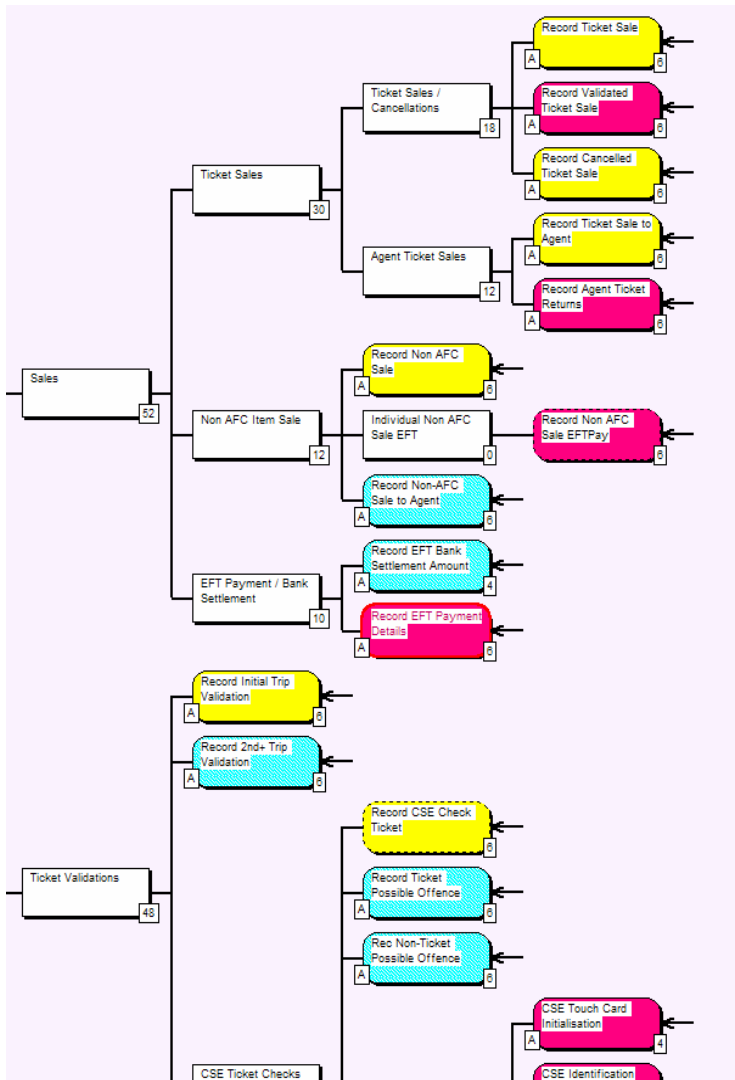


Not the Nine O'clock News

- ❖ Majority of large software projects tend to run late and / or exceed their budgets
- ❖ Commonly Cited “Reasons”
 - The project was **much bigger** than we originally thought
 - The client kept **changing** the requirements
 - The client had **no idea** what they wanted so it was really impossible to estimate in the first place
- ❖ A Key Root Cause –
 - “Historical **failure of the software industry to quantify the dimensions** of the software project before beginning – leading to wrong estimation” – (Capers Jones)
 - **Failure** to properly **monitor** and **control** software project dimensions during the project i.e. project **scope** and project **size**.....



What Goes on in Software Projects



❖ This software project **grew** from:

■ ~1000 FPs at Tender Response
to

■ > 7000 FPs at Implementation

(Colour Code indicates **point** in the Life Cycle where **Transaction Entered** the Project)

❖ The contract was **fixed price**.

❖ Project resulted in **litigation**

❖ The Client steadfastly maintained that there was **no change** in the **scope** of the project.



What is Scope?

“Common” Definitions

- ❖ Refers to the way we describe the **boundaries** of a project
- ❖ Describes what the project will **deliver** and what it will **not deliver**
- ❖ May also include some other aspects of the project, e.g.
 - Organisations affected / not affected
 - Business processes impacted / not impacted
 - And so on.



Software Project



What is Scope?

❖ As an observation:

- Clients usually perceive 'Scope' as applying to the **problem to be addressed** by the software
- Software suppliers generally understand 'Scope' as applying to the **software solution to be delivered**.



❖ These two views of scope are obviously related but they are **not the same**.

❖ **A software solution can grow in scope for the software supplier while the client sees no change in the problem being addressed.**



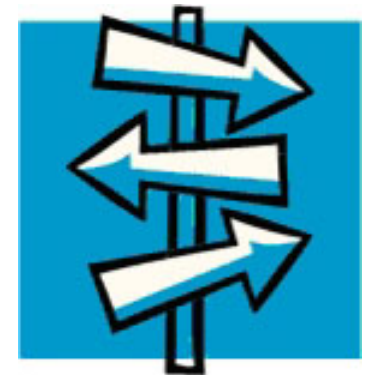
What is Scope Management?

❖ “The function of **controlling** a project in terms of its goals and objectives through the processes of conceptual development, full definition or scope statement, execution and termination.”



Why is Scope Management Important?

- ❖ Every non-trivial project has a business case which is governed by **cost** and / or delivery **timeframe**.
- ❖ There are expectations that a project will produce what is in **scope** within an agreed **cost** and within an agreed **timeframe**.
- ❖ “**Manage**” implies **knowing the scope and any change in scope** (and **cost** and **timeframe**) **at all times** so that **any business decisions can be made based on knowledge, rather than hope.**



What is Scope Creep?

- ❖ Describes the **continual extension of the scope** of a project
- ❖ The impetus for project scope changes can be external or internal

External Source

- ❖ Impetus: **Client**
- ❖ Usually via **formal** change request
- ❖ Increased effort, time and cost can be easily **justified** to the client

Internal Source

- ❖ Impetus: **Developer**
 - ❖ No formal change requests i.e. no change to requirements
 - ❖ **Difficult to justify** increased effort, time and cost to the client
- This type of Scope Creep strikes fear into the hearts of developers





Scope Management Criteria for Method

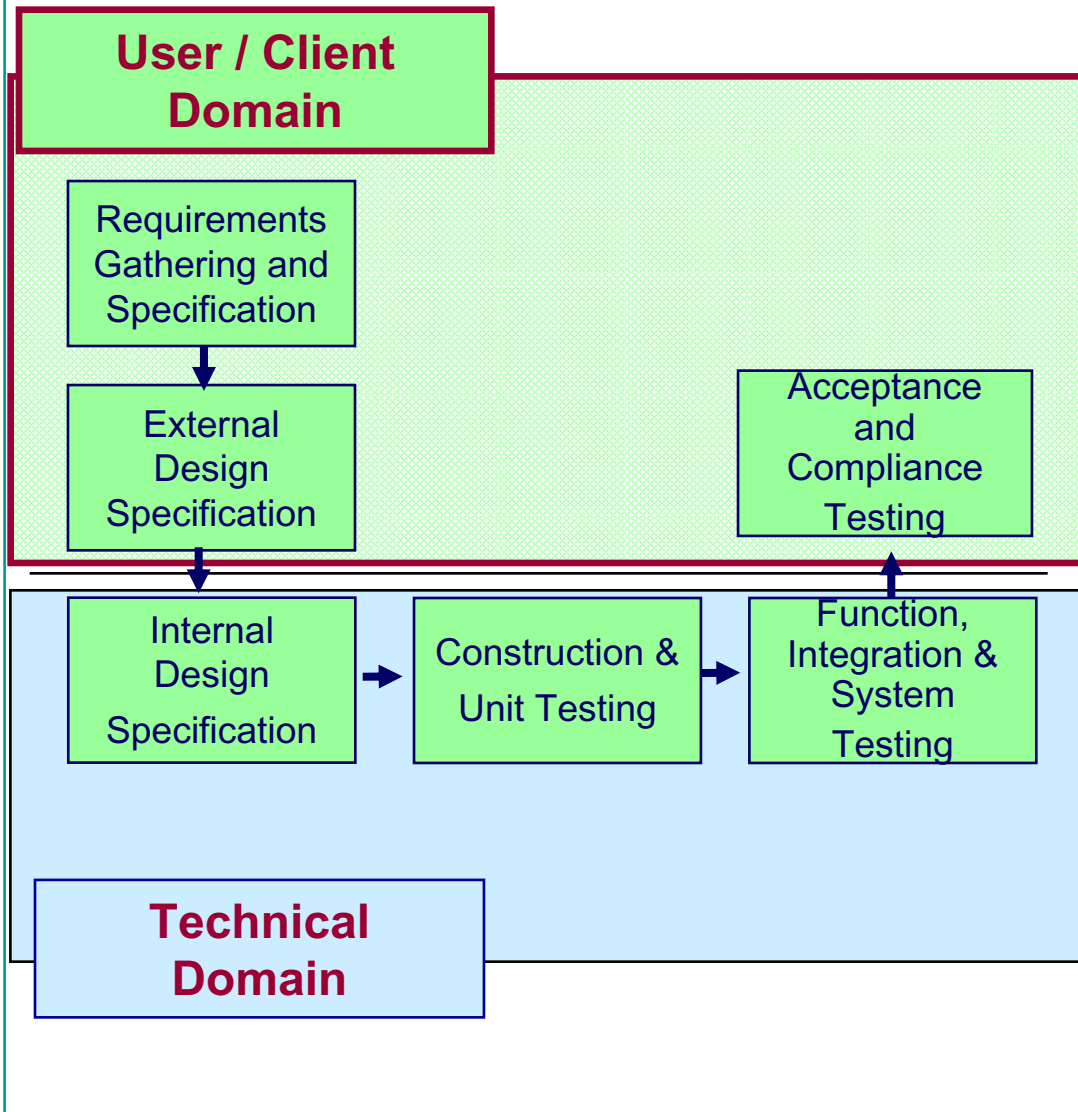
- ❖ In order to manage scope successfully, the client and the supplier need to **share a common view** of scope.

- ❖ Ideally, this common view should:
 - Allow **all the functions which comprise the software product to be identified** in accordance with a set of rules so that:
 - A product **scope baseline** of the features and functions can be established and agreed
 - **Variation** from the baseline can be unequivocally recognised

 - Have a recognised relationship with a key driver of project cost and schedule (timeframe) so that it is easy to assess the impact of changes to scope on cost and schedule.



FPA provides the Common View

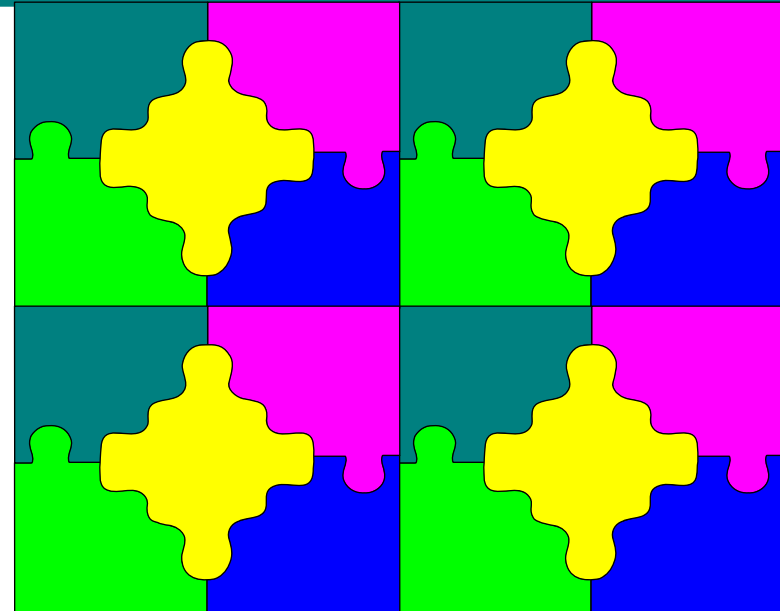


- ❖ The software development process operates in **two different knowledge domains**
- ❖ In order to manage scope successfully, the client and the supplier need to **share a common view** of Scope.
- ❖ Scope Management must operate in the **User / Client Knowledge Domain**
- ❖ This is the knowledge domain of FPA



FPA can provide the Rules

- A software application is, in essence, a defined **set of functions**.
- If we **fail** to identify any of the software's functions, we **fail** to fully and properly determine the software's scope.



- In order for the scope of a software project to be **properly** defined, **every** unique function - Transactional and Data Functions - which contributes its functionality to the software must be **identified**.
- **IMPORTANT: This represents a departure from FPA. Use the “identification” rules and include the function - regardless of whether the sizing rules can be applied.**





FPA can provide the Rules

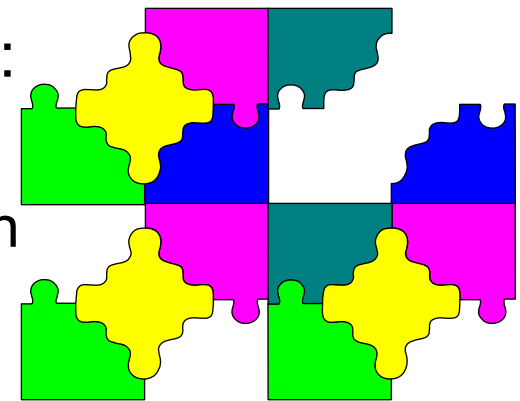
❖ **Transactional Functions** represent the functionality provided to the user for the processing of data by an application

- An elementary process is the smallest unit of activity that is meaningful to the user(s).
- The elementary process must be self-contained and leave the business of the application being counted in a consistent state

❖ **Must include all transactional functions** which conform to these definitions to get complete coverage:

- E.g. automated functions,
- Functions where no data or control information crosses the boundary

etc





FPA can provide the Rules

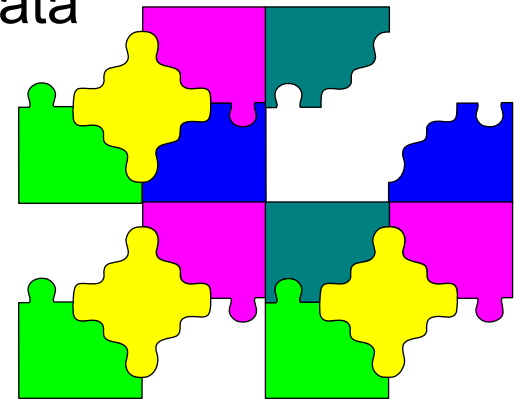
❖ **Data Functions** represent the functionality provided to the user to meet internal and external data requirements

- A user identifiable group of logically related data or control information.

❖ **Must include all data functions** which conform to these definitions to get complete coverage.

Do not exclude, for example:

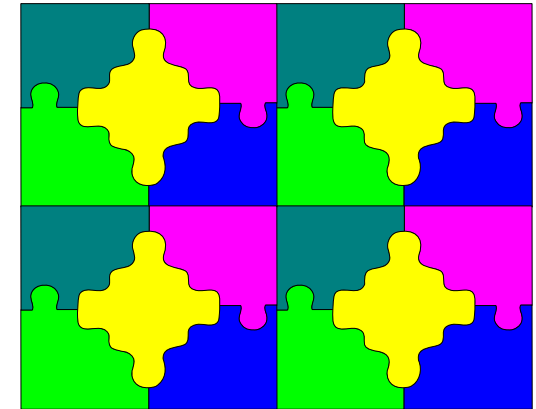
- “Code” tables where these contain business data
- Manually maintained data groups where these contain business data



FPA and Scope Management

❖ **Scope Baseline** at project outset

- List of all Transactional and Data Functions
- Cross-referenced to Milestone Documents
- Agreed as reasonable representation



❖ **Identification of Variation**

- New “snapshot” matched to previous
- At least:
 - At each Project Milestone
 - Whenever there is a “clarification” event such as Workshop
- On a regular, eg, monthly, basis

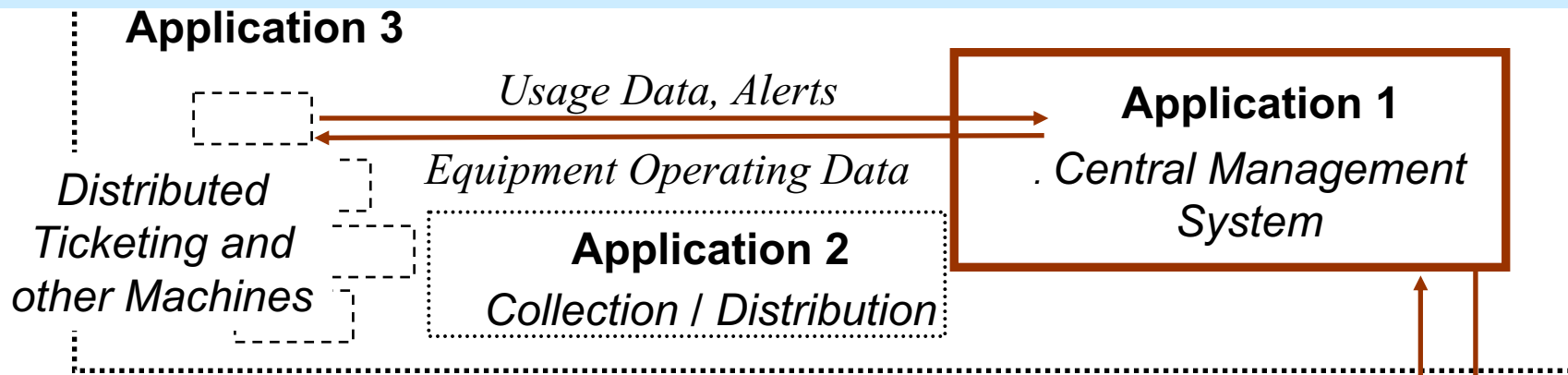
❖ FP Analysts should endeavour to be recognised as a member of the development team



Example Case Study

Context Diagram

Total Software Solution – Ticketing for Multi-Modal Transport System – (Trains, Trams, Buses)



| | |
|----------------------|--|
| Transport Management | <i>Management Reports, Maintenance of EOD and other Reference Data, User Security / Access</i> |
| Ticket Distribution | <i>Ticket Sales, Returns, Refunds</i> |
| Bus Schedules | <i>Schedules</i> |
| Armaguard | <i>Money Collections</i> |
| General Ledger | <i>GL Postings</i> |
| Bank | <i>Authorisations and Settlements</i> |



Hiking in a Fog



❖ Capers Jones has likened software development to hiking in a fog where the fog slowly lifts to reveal the landscape.

❖ **IMPORTANT: Recognize that:**

- **We won't know everything** at the beginning.
- **We will gain knowledge as the project progresses** and must adjust our plans accordingly.



As the Fog Starts to Lift Changes to Scope

❖ Expect these types of 'internal' changes

■ Transactional Functions

- New
- Split
- Merged
- Dropped
- Adjusted

■ Data Functions

- New
- Dropped
- Adjusted





As the Fog Starts to Lift Transactions - 'New'

- ❖ “Brand New” requirement for this project milestone
- ❖ Cannot find any ‘match’ with any previous requirement
- ❖ Just appear in system documentation for this milestone. i.e. no formal CRs

| Previous Milestone | Current Milestone |
|--------------------|---------------------------|
| ----- | Record Overpayment Refund |

- ❖
 - Sometimes appear as a result of an “informal” agreement for a new area of responsibility.

| | |
|-------|------------------------------|
| ----- | Upload Printable Schedules |
| | Upload Processable Schedules |





As the Fog Starts to Lift Transactions - 'Splits'

- ❖ New Requirement for this project milestone.
- ❖ Has emerged as an independent function from a function known at the previous milestone.
- ❖ Before there was 1, now there is > 1

| | |
|--------------------|------------------------------|
| Record Ticket Sale | Record Ticket Sale |
| | Record Validated Ticket Sale |

| | |
|--------------------------------|---|
| A/C/D/E Earned Value Fare Rule | A/C/D/E Earned Value Fare Rule - Stations (Trains) |
| | A/C/D/E Earned Value Fare Rule - Route Point (Buses and Trams) |





As the Fog Starts to Lift

Transactions - 'Splits'

- ❖ 1 report repeatedly became many reports
- ❖ No of reports confirmed by analysis of SLOCs

Report Ticket Sale

Report Ticket Sales by Numbers
x Mode x Mode Business Levels

Report

Ticket Sales by \$Value x Mode
x Mode Business Levels

- ❖ 1 Requirement was formally reinterpreted by a third party to expand into many, many new reports.

Report Period End Cash to Sales
Reconciliation

Report Period End Cash to Sales
Reconciliation

72 additional Reconciliation
reports





As the Fog Starts to Lift Transactions - 'Dropped'

❖ Dropped :

- In the system documents for one milestone but then no further mention.
- No associated CR.

| | |
|-----------------------------------|-------|
| Report Invalid Agent Ticket Sales | ----- |
|-----------------------------------|-------|





As the Fog Starts to Lift Transactions - 'Merges'

- ❖ Absorbed into a another requirement.
- ❖ No associated CR.

| | |
|------------------------------------|-------------------------|
| Report Government Bus Ticket Sales | Report Bus Ticket Sales |
| Report Private Bus Ticket Sales | |





As the Fog Starts to Lift Transactions - 'Adjustments'

- ❖ High level requirement recorded as an estimated number of instances
- ❖ When the number is confirmed, we may have an adjustment.
- ❖ Adjustment applied against size contingency pool.

| | |
|-------------------------|------------------------|
| Management Reports x 60 | 54 actual Reports |
| | 6 Reports "adjustment" |





As the Fog Starts to Lift Logical Files - 'New'

- ❖ “Brand New” requirement for this project milestone
- ❖ New Logical Files bring their new Logical Transactions with them
- ❖ Cannot find any ‘match’ with any previous requirement
- ❖ Just appear in system documentation for this milestone. i.e. no formal CRs
- ❖ May be new “business” data

| | |
|-------|-----------------------------|
| ----- | Actual Vehicle Trip Details |
|-------|-----------------------------|





As the Fog Starts to Lift

Logical Files - 'New'

- ❖ May be “enabling” infrastructure data e.g EOD (Equipment Operating Data)

| | |
|-------|-----------------------|
| ----- | EOD Baseline Register |
| ----- | EOD Change Requests |
| ----- | EOD File Versions |

- ❖ May be “enabling” reference data

| | |
|-------|-------------------|
| ----- | Equipment Purpose |
| ----- | Time Bands |
| ----- | Offence Types |





As the Fog Starts to Lift Logical Files - 'Dropped'

- ❖ In the system documents for one milestone but then no further mention.
- ❖ No associated CR.
- ❖ Associated maintenance and other associated transactions also dropped

| | |
|-------------------------|-------|
| Equipment Operators | ----- |
| Hot Listed Credit Cards | ----- |
| Station Group | ----- |





As the Fog Starts to Lift Logical Files - 'Adjustments'

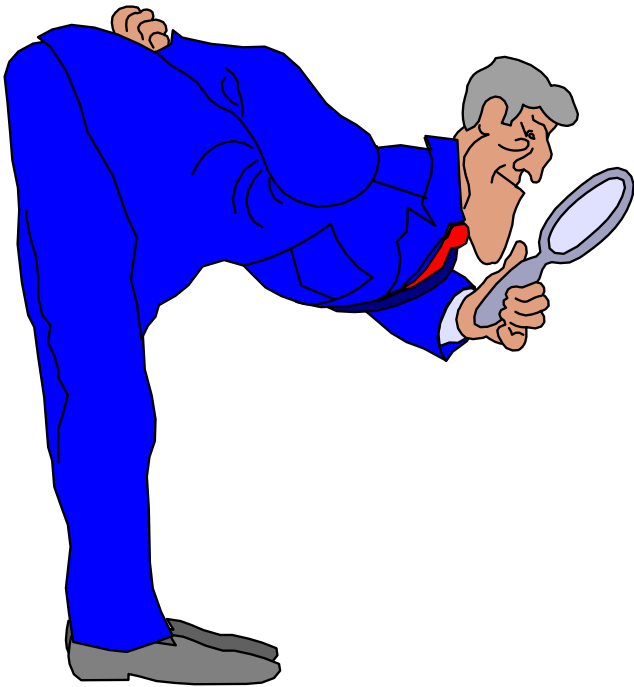
- ❖ High level requirement recorded as an estimated number of instances
- ❖ When the number is confirmed, we may have an adjustment.
- ❖ Adjustment applied against size contingency pool.

| | |
|-----------------------|---------------------------------|
| Reference Tables * 40 | 30 actual Reference Tables |
| | 10 Reference Table "adjustment" |



Communicating “Growth” to Stakeholders

- ❖ Project stakeholders in the Client Domain readily understand the **present / absence** of functions.
- ❖ As far as possible, don’t talk about Function Points.
- ❖ Stakeholders like summaries but will usually want to be able to “drill down” for further justification.



Reporting "Growth" – Drill-Down Traceability

Process 2. Validate Usage Data

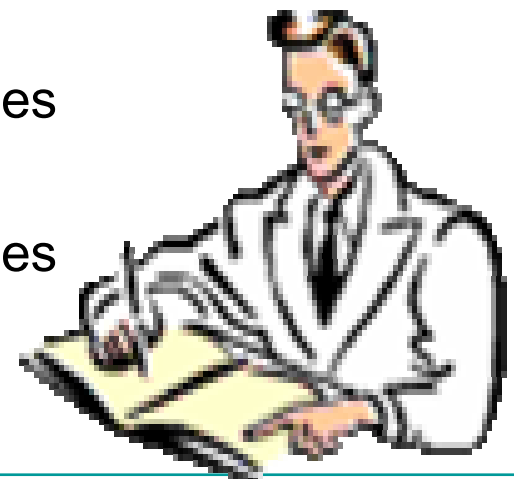
Showing Split

| Tender Response | Requirements Specification | Functional Specification |
|--------------------------------|-------------------------------|--------------------------------|
| Record Ticket Sale | Record Ticket Sale | Record Ticket Sale |
| | | Record Validated Ticket Sale |
| Record Cancelled Ticket Sale | Record Cancelled Ticket Sale | Record Cancelled Ticket Sale |
| Record Tickets Issued to Agent | Rec Ticket Sales to Agent | Record Ticket Sale to Agent |
| | | Record Agent Ticket Returns |
| Record Hot Ticket Usage | | |
| Record Hot Card Usage | | |
| | | Record Equipment Cut-Off |
| Record Equipment Access | | |
| | Unreceived Transaction Report | Rpt Unreceived - Unpolled Locn |
| | | Rpt Unreceived -Operator Trans |
| | | Rpt Unreceived -Equipment Tran |
| | | Rpt Unreceived -Validations |
| (15 Logical Transactions) | (33 Logical Transactions) | (68 Logical Transactions) |



What about the Function Points?

- ❖ Project stakeholders in the Client Domain readily understand the **presence / absence** of functions
- ❖ However, we need to **extend size into Function Points**, to show impact on effort, schedule and cost
- ❖ Allocate Function Points to functions
- ❖ For those functions “outside the method”,
 - Determine the Function Type based on Primary Intent
 - Allocate complexity as follows:
 - Low – few Data Elements and Files Types Referenced / Record Element Types
 - High – many Data Elements and Files Types Referenced / Record Element Types
 - Average – neither Low nor High

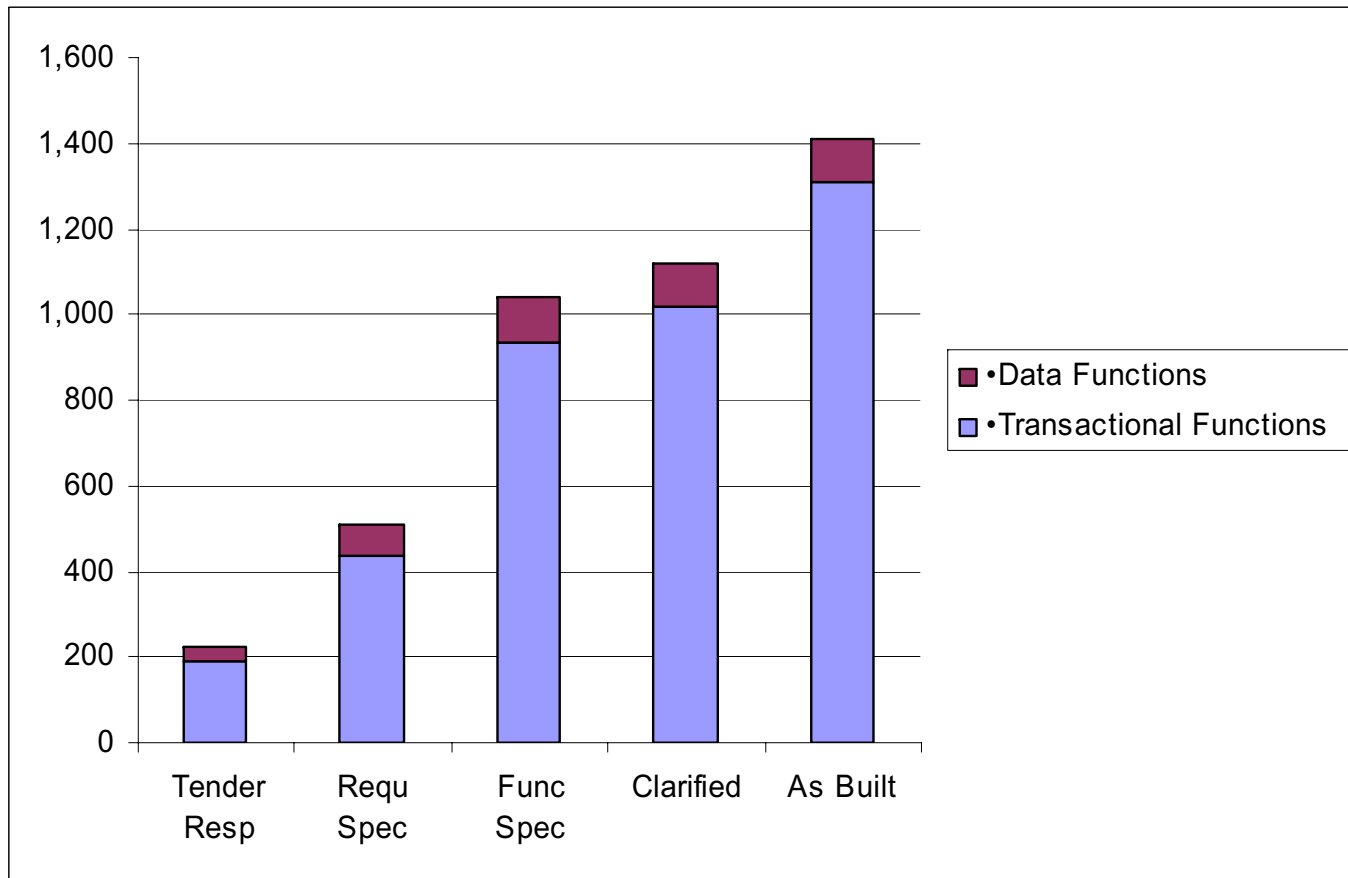


As the Fog Starts to Lift Changes to Numbers of Functions / FPs

| Measure | System Definition Documents | | | | |
|------------------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|
| | Tender Resp | Req Spec | Func Spec | As Clar-ified | As Built |
| <u>No of Functions</u> | | | | | |
| • Transactional Functions | 189 | 439 | 936 | 1016 | 1307 |
| • Data Functions | 33 | 68 | 102 | 102 | 103 |
| <u>Total</u> | <u>222</u> | <u>507</u> | <u>1038</u> | <u>1118</u> | <u>1369</u> |
| <u>No of Function Points</u> | | | | | |
| • Transactional Functions | 785 | 2055 | 4907 | 5320 | 6473 |
| • Data Functions | 246 | 536 | 868 | 868 | 875 |
| <u>Total</u> | <u>1031</u> | <u>2591</u> | <u>5775</u> | <u>6188</u> | <u>7348</u> |

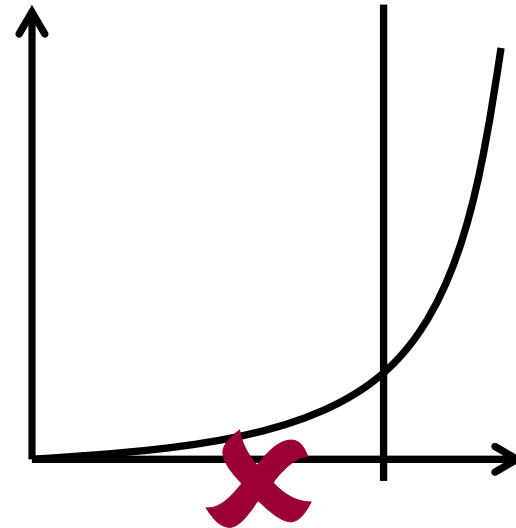
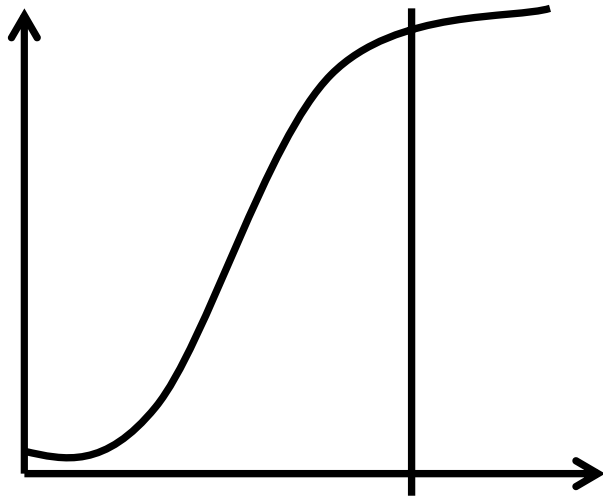


As the Fog Starts to Lift Changes to Numbers of Functions





As the Fog Starts to Lift Changes to Numbers of Functions



As an observation, growth tends to be more like this.



As the Fog Starts to Lift 'Changes to Complexity'

| Complexity Indicators | System Definition Documents | | | | | Indust Ave |
|--------------------------|-----------------------------|----------|-----------|---------------|----------|------------|
| | Tender Resp | Req Spec | Func Spec | As Clar-ified | As Built | |
| Value Adjustment Factor | 1.05 | 1.10 | 1.12 | 1.12 | 1.12 | |
| Average Complexity - EPs | 4.0 | 4.3 | 4.7 | 4.7 | 4.6 | 4.6 |
| Average Complexity - LFs | 7.1 | 7.2 | 7.6 | 7.6 | 7.6 | 7.1 |
| Ratio - No of EPs: LFs | 5.7 | 6.5 | 9.2 | 10.0 | 12.3 | 5.3 |
| Ratio - FP Size EPs: LFs | 3.2 | 3.8 | 5.7 | 6.1 | 7.4 | 2.7 |





Key Points

- ❖ Be prepared to deal with uncertainty.
 - We won't know everything at the beginning.
 - We will gain knowledge as the project progresses and must adjust plans accordingly.
- ❖ Managing Scope means knowing the scope and size of your project at all time.
- ❖ FPA provides an objective view of scope which can be understood by both clients and suppliers
- ❖ FPA provides the rules for identification of all the functions. Complete coverage of the software product is essential.
- ❖ FPA allows for easy assessment of change on cost, timeframe and the business case.





Once the Fog Has Lifted



**Thank You
Questions?**

