Field Testing Full Function Points: Recent Results

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Presented at

NESMA Autumn Congress 1998

November 10, 1998

UQAM

Agenda...

- Context
- Real-Time Software Limitations of FPA
- Full Function Points Core Concepts
- Initial Test Results
- Recognition from ISBSG
- Additional Field Tests
- Conclusion

Context...

IFPUG's Function Points (FPA, v. 4.0):

- **Designed and refined for the characteristics of business applications type of software,**
- **Measures software delivered to external *human* business users,**

BUT...

Context...

- **Since 1986, FPA has been criticized as not being applicable to all types of software:**

  "A problem with the function point approach is that it assumes a limited band of application types: typically, large file-based systems produced by agencies such as banks ... , and is unable to cope with hybrid systems such as a stock control system with a heavy communication component."[1]

- **Although the FPA measurement method generates results in such cases, these results do not constitute an adequate size measurement.**

1: Ince D.C., History and industrial applications, in Fenton N.E., Software Metrics: A Rigorous Approach, Chapman & Hall, 1991, p. 283

Context...

- Real-Time systems (RTS) are examples of software that differ from “business application” software,

- RTS are thus examples of software for which FPA is not an adequate FSM.

...Is the functional size of real-time systems worth measuring ?

Context...

- RTS represent approximately 50 % of the software in production in the United-States,
- RTS contributes to the software portfolio; it has to be purchased, customized, documented, maintained, etc.
- Supported RTS should be included in the assignment scope when calculating support productivity, development and maintenance budgets, etc.
- RTS delivered as part of a project will need effort assigned to it and should be included in total project size for accurate estimates.

Real-Time software limitations of FPA...

So, what are the limitations of FPA when applied to RTS ?

- **Value Adjustment Factor does not adequately cover the impact on productivity for RTS,**

- **DATA LIMITATIONS:**
  - **as opposed to "external business application software", the primary role of RTS is NOT to maintain and report stored data (*primary role is to process input data for immediate response or output*),**
  - **in RTS, most of the data input is not stored permanently,**
  - **RTS data is simple and typically includes**
    - ✓ **historical logs of input values**
    - ✓ **threshold values**
    - ✓ **parameter control values.**

Real-Time software limitations of FPA...

- **PROCESS LIMITATIONS:**
  - **RTS processes contain many internal sub processes where functionality is not represented by data crossing the external boundary,**
  - **RTS processes display an exponential difference in functional size that cannot be recognized by the twofold increment in allocated FPA,**
  - **RTS processes do not usually display a predominant input or output characteristic and thus cannot easily and consistently be classified as "IFPUG input, output or inquiry".**

Full Function Points core concepts...

- **By design, the FFP measurement method:**
  - **adopts a FULL functional perspective spanning more than the functionality perceived by RTS's human users; it includes functionality interacting with other software and physical devices,**
  - **does not impose a maximum size to a process; the size of a process is the SUM of the size of its individual sub processes,**
  - **does not assign a predominant functional role (input or output) to each process,**
  - **does not use "value adjustment factors".**

Full Function Points core concepts...

USERS
Human,
Hardware devices,
Other software

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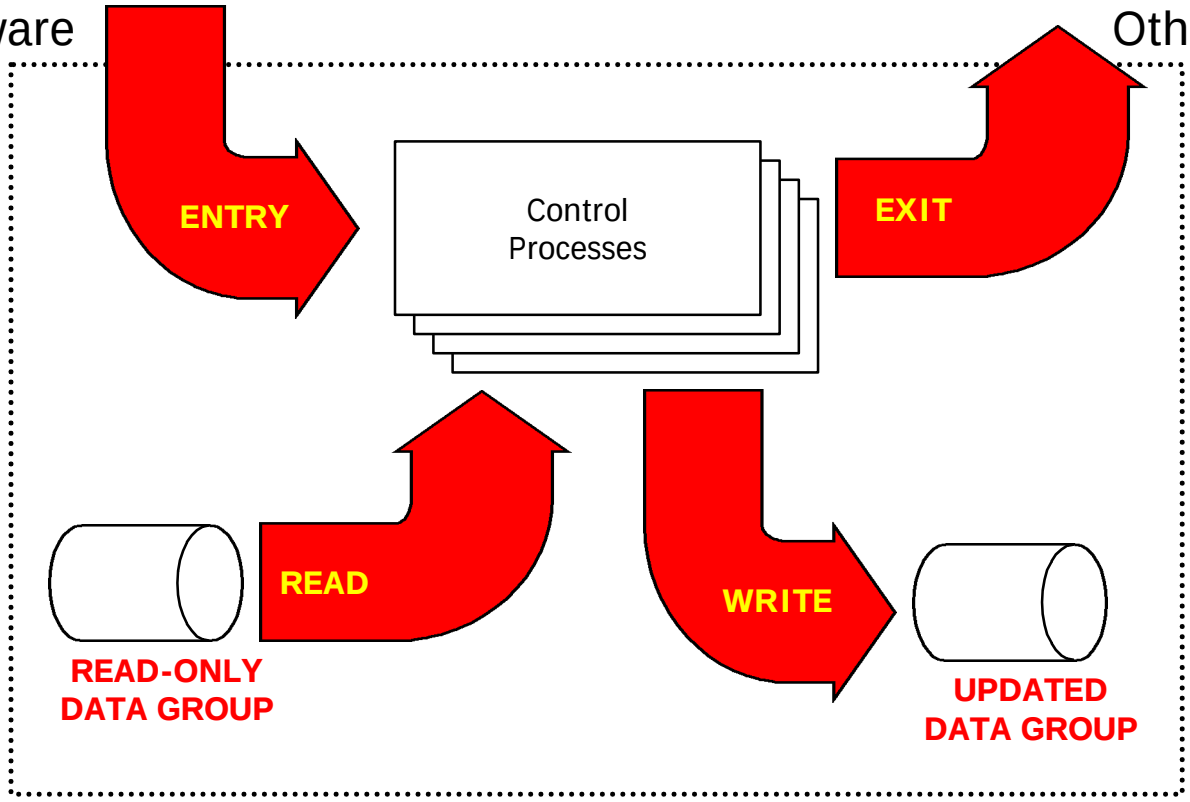


Measurement Boundary

Full Function Points core concepts...

THEREFORE, FFP:

- **... can be used to measure the functional size of any type of software, including RTS,**
- **... offers a result that is not restricted to a twofold maximum range for each identified process,**
- **... enables processes to be consistently sized when they do not display a predominant input or output characteristic,**
- **... can be applied to processes whose functionality does not pass data externally,**
- **... enables measurement of simple groups of data.**

Initial test results...

- **First set of field tests (1997):**
  - **conducted by the research team,**
  - **3 RTS or embedded software products measured,**
  - **2 industrial partners in USA and Canada,**
  - **<u>GOAL</u>: compare IFPUG 4.0 FPA with FFP**
  - **<u>RESULTS</u>:**
    - ✓ **FFP results close to FPA when processes contained small number of sub processes,**
    - ✓ **FFP results yield larger size measure when processes contained large numbers of sub processes.**

Initial test results...

- **Second set of field tests (1997):**
  - **conducted without assistance from the research team,**
  - **RT operational software products,**
  - **1 industrial partner in Japan,**
  - **GOAL: evaluate FFP for relevance and usability**
  - **RESULTS:**
    - ✓ **concepts and procedures are clear and easy to understand, usable without assistance from measurement specialists,**
    - ✓ **FFP functional coverage established at 97% of control processes expected to be measured.**

Recognition from ISBSG...

- ISBSG: International Software Benchmarking Standards Group
  - Maintains a repository of measured software products and projects,
  - Currently over 500 historical software projects available,
  - Rigorous entry and validation methodology,
  - Functional size measure MANDATORY for acceptance of project's data

Recognition from ISBSG...

- FFP recently recognized as a valid FSM by ISBSG
  - FFP accepted based on list of rigorous criteria,
  - Interim status: accept project where software measured with FFP,
  - After submission of a minimum number of FFP measured software products, ISBSG will modify entry and validation software.

Additional set of field tests...

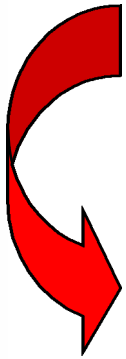
- **CONTEXT:**
  - **4 industrial partners**
    - ✓ **3 in North-America,**
    - ✓ **1 in Asia (not Japan).**
  - **10 software products**
    - ✓ **never measured before with FFP,**
    - ✓ **8 products related to the telecom. industry,**
    - ✓ **1 product related to operation of a power utility org.,**
    - ✓ **1 product related to the military sector.**
  - **All software products measured by the same individual**
    - ✓ **CFPS,**
    - ✓ **12 years of experience in FSM.**

Additional set of field tests...

1st GOAL: further compare IFPUG 4.0 FPA and FFP

RESULTS:

Product	Type	FPA size	FFP size
A	Real-Time	210	794
B	Real-Time	115	183
C	Real-Time	N / A	2 604
D	Real-Time	43	318
E	**Mostly MIS**	**764**	**791**
F	MIS (batch)	272	676
G	**MIS**	**878**	**896**



Size is similar when measuring typical MIS software products

Additional set of field tests...

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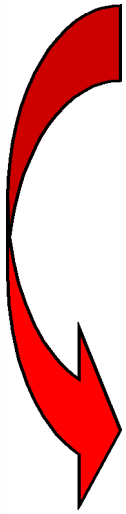

One R-T software product could only be sized with FFP

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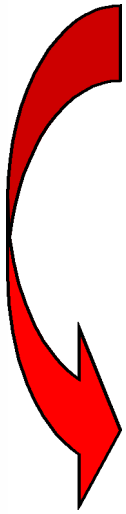

Larger functional size for software products with numerous R-T processes (A, B and D); even for MIS with fewer direct user interactions (F).

Additional set of field tests...

2nd GOAL: explore magnitude of key economic values

RESULTS:

These 3 software products are all R-T software

Product	Size (FFP)	Effort (ph)	Duration (mth)	Unit effort (ph/FFP)	Sched. del. Rate (FFP/mth)
H	205,4	3 913	26	19,1	7,9
I	138,0	6 580	16	47,7	8,6
J	198,0	7 448	14	37,6	14,1

Until further data is available to allow statistically significant analysis, these should be interpreted as "order of magnitude" figures.

Conclusion...

- **FIELD TEST RESULTS SUMMARY:**
  - **1st set of field test**
    - ✓ FFP functional size results reflect the varying functional size typically found in RTS processes,
  - **2nd set of field test**
    - ✓ FFP concepts and procedures can be applied without the help of an FSM specialist,
    - ✓ From a practitioner's point of view, FFP offers a high degree of functional coverage when applied to RTS,

Conclusion...

- **FIELD TEST RESULTS SUMMARY:**
  - **3rd set of field test**
    - ✓ Further illustrates the difference in functional size obtained from FPA and FFP when both methods are applied to the same software products,
    - ✓ Provides first indications on order of magnitude for key economic ratios related to FFP.

Acknowledgments

- The Software Engineering Management Research Laboratory of the Université du Québec à Montréal is supported through a partnership with Bell Canada.

- Additional funding is provided by the Government of Canada.

For more information...

- http://www.lrgl.uqam.ca
- http://www.lmagl.qc.ca/