Symbiotic International Consulting Services (SICS)

Developing Staff Resourcing Standards Using Industrial Engineering (IE) Work Quantification Techniques for Managing Policy, Program and Evaluation Activities

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Presentation Objectives

- To discuss some of the challenges in measuring white collar task and jobs (Public /Service Sector Productivity)
- To provide an overview of the Industrial Engineering (IE) approach to defining performance results and developing staff resourcing standards for workload based activities (output driven)
- To provide an introduction to staffing (Person Year – PY) formula for managing program and evaluation activities

Presentation Objectives

- To provide an introduction to IE Work Quantification Techniques (Fractioned Professional Estimates) for developing Engineered Standard for white collar tasks
- To discuss linkages to Planning, Performance Results Measurement, Monitoring, Evaluation and Reporting Achievements

Historical Perspective: Industrial Engineering (IE) Pioneers

- **Fifteenth century monks**
- **Radolphe Perronet (1760) – Time & Motion Economy**
- **Charles BabBage (1832) – Time study & Incentives**
- **Frederic Winslaw Taylor (1911) – Scientific Management**
- **Gilbreths, Frank and Lillian (1911) – Laws of Human Motion**
- **Charles Bedaux- (1920) - Rating Concept**
- **Marvin E Mundel – Performance Measurement of White Collar Jobs (1975)**

Industrial Engineering (IE) Definition

IE is concerned with the design, improvement, and installation of integrated systems of people, material, information, equipment, and energy. It draws upon specialized knowledge and skills in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems.

Source: Institute of Industrial Engineers (IIE)

Challenges in determining Staff Resourcing Standards in the Public and Service Sectors

"Managers in the government and service sector have found the task of measuring and controlling the work of white collar knowledge workers most difficult, if not impossible to carry out".

Challenges in determining Staff Resourcing Standards in the Public and Service Sectors

"What makes you so sure that you can measure our services: Compensation Advisory Services – production of policies, directives, notices, manuals, etc."

" We are not in the business of producing widgets."

Staff Resourcing Standards and Evaluation Excellence Standards

- Evaluation Planning and Issues
- Competency
- Objectivity and Integrity
- Consultation and Advice
- Measurement and Analysis
- Reporting

Reference: Treasury Board Secretariat of Canada – Evaluation Policy – April 1, 2001

The I E Approach to Defining Performance Results: outputs and outcomes

- **Based on the analysis of the work of an organization (or part of it)**
- **Hierarchical order of performance results metrics: (outputs & outcomes)**

Definition of a Performance Results Metric or Work-unit

- **A Performance Result Metric also referred to as a Work-Unit is a new term used to denote the amount of work or results of an amount of work in quantitative terms**

A 10th Order Performance Results - Metric Structure or Model

- 10^{th}, 9^{th} 8^{th} Order Metrics (Final, Intermediate, Immediate Outcomes): What is achieved due to the outputs
- 7^{th} Order Metric (Gross Output): A large group of end products of programs
- 6^{th} Order Metrics (Program Outputs): A group of (outputs) which are part of gross output

A 10th Order Performance Results - Metric Structure or Model

- 5th Order Metric (End Product): A unit of final output
- 4th Order Metric (Intermediate Product): A part of a unit of final output
- 3rd Order Metric (Task): Any part of an activity
  associated with a unit of output

A 10th Order Performance Results - Metric Structure or Model

- 2nd Order Metric (Element): A part of a task
- 1st Order Metric (Motion): A human motion performed, for example, reach, grasp, etc.

10th Order Structure- A Hierarchical ordering of Performance Results Metrics

- **Links the 10th order strategic statement of performance to the use of resources (cost, person years)**
- **Forecast of future performance results or work loads for end products**
- **Facilitates development of performance or work load based staff resourcing standards using work quantification techniques**

Staff Resourcing: Person Year – PY (Full Time Equivalent – FTE) Forecasting/Estimating - General Formula

- Task/Work Standard times
- Workload Forecast of end products for the period
- Budgeted year anticipated productivity or efficiency factor of the work group
- PY Definition - the number of person hours available for productive work per person year,

I E Work Quantification Techniques for Developing Standard Times

- Using historical work-time and work count if available;
- Using an extensive period to collect work-time and work count data by self reporting;
- Using experience to make estimates of task times (Analytical Estimating, Fractioned Professional Estimates - FPE);
- Making direct observations, by designated observers over a period of time (Time Studies);
- Synthesis using predetermined time values , and
- Some combination of the above approaches

Types of Standard Times

Did-take-times

How long it took to perform the work-unit in some past period.

Should-take -times

How long it should take to perform a work-unit in some future period under certain specified conditions.

Did Take Versus Should Take Times

- **S - Standard Time= [(WT/WC) M] + A**

- WT - Work Time - the time spent by an employee on productive work;
- WC - Work Count - the number of units of output associated with WT;
- M - a modifier - which is an assessment of the pace (performance rating factor)
- A - an addition of time to allow for recovery from fatigue and for attention to personal needs.

Application of the Formula

WT = 100 Minutes

WC = 100 Units

Did Take Time = WT/WC

= 100/100 = 1 minute per work unit

Should Take Time

Did Take Time x Modifier (Efficiency Factor if 100%, M = 1, 80% M = 0.8, 120% M = 1.2)

A = 10% Basic Fatigue + 2% Personal Needs = 12% Recovery Allowance

Application of the Formula

- **S - Standard Time = [(WT/WC) M] + A**

Should Take Time at M =100% efficiency or 1
[(100/100) 1] + 12% of WT
S = 1 + 12% = 1 + 0.12 = 1.12 Standard Minutes

Should Take Time at M = 80% efficiency or 0.8
[(100/100) 0.8] + 12% of WT
0.8 + 12% = 0.8 + 0.12 = 0.92 Standard Minutes

Should Take Time at M = 120 % efficiency or 1.2
[(100/100) 1.2] + 12% of WT
1.2 + 12% = 1.2 + 0.12 = 1.32 Standard Minutes

Analytical Estimating, Fractioned Professional Estimates - FPE

Setting Should Take Time Standard with FPE

- Identify the 5th Order Performance Result Metric (End Product/Service)
- Assemble a team of professionals who are experienced with the tasks associated with the end product
- Break down the end product in to manageable tasks required to produce the product
- Write descriptions of the tasks (methods and conditions required)

Analytical Estimating, Fractioned Professional Estimates - FPE

Setting Should Take Time Standard with FPE

- Provide the break down of the tasks and descriptions to the team
- Instruct team to estimate the time required to perform the tasks based their knowledge and experience
- Reach professional consensus on the estimated time values (all estimates are at the 100% efficiency factor and includes recovery allowances) – an iterative process
- Total individual task times to arrive at total productive minutes/hours to produce a unit of the end product

An Application of FPE to the Processing of cases: Portability/Vesting/Lock-in Provision of Pension Reform Legislation

	Task	Estimated Time
1.	DSS 2000 certification	28.75 minutes
2.	On-line verification of funds transfer	5.0 minutes
3.	Transfer of funds e.g. Locked-in RRSP	32.0 minutes
4.	Audit of Transfer of funds	10.4 minutes
	Estimated Total Processing Time/Case	76.15 Standard Minutes

Workload Forecasting/Estimating

- Workload forecasting is the prediction of outputs, by kind (work-units), required for some future period.
- Estimating techniques may employ any type of mathematical projections which takes future plans into account and draws upon past experience.

Workload Forecasting/Estimating Techniques

- Simple extrapolation of raw historical data
- Historical data extrapolated with qualitative or quantitative reasoning
- Simple extrapolation of smoothed historical data
- Historical data extrapolated with the aid of various theories of growth or change, and
- Actuarial analysis

Budgeted Year Anticipated Productivity

- Staff Resourcing at an anticipated productivity level of 100% helps management to assess gaps in productivity
- Need for modifying Work Unit Times to 100% efficiency levels (as seen in previous slides)

Person Year (PY) Definition

- Number of days available for work = 250 days (1875 hours)
  (7.5 hours x 250)

Less Average number of days
of paid leave:

- Annual = 15 days
- Sick = 6 days
- Special = 4 days
- Training = 5 days = 30 days (225 hours)

- Days available for Productive work = 220 days (1650 hours)

Note: The PY definition allows for a variation of plus or minus 4% providing a range of 228.8 days to 211.2 days.

Determining Staff Resourcing levels

- Functional Person Years based on organisational design/Structure

Examples: Director, Manager or Chief of a unit,

- Work load based activities

Examples: Number of end products to be completed in a given year: evaluation studies/reports; training workshops;

Application of the Staff Resourcing (PY/FTE) General Formula

- Estimated Standard Time = 76.15 Minutes/Case – Portability/Vesting/Lock-in
- Forecasted Workload = 16,775 cases/year
- Budgeted year anticipated productivity or efficiency factor of the work group = 100%
- PY Definition - the number of person hours available for productive work per person year = 224 Days or 1680 hours
- Calculation of work load based Staff Resourcing Standard for activity:

(76.15 x 16,775)/60 = 21,290 Productive Hours

- Calculated Number of PYs = 21,290/1680 = 12.67 PYs

Conclusion

- The use of standard times together with the workload forecasts, a prediction of the productivity level for the forecast period and the PY definition, determines the staff resource required for the period.
- The design of such a control system is referred to as Zero based budgeting.
- Inaccuracies in determining the four variables of a zero based budgeting system leads to over or under staffing of activities.

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