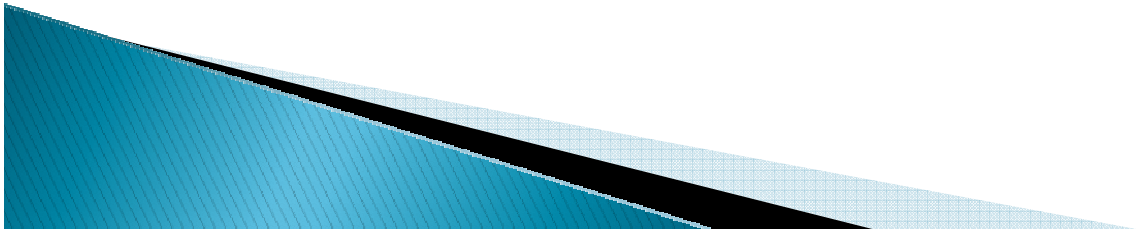
Objectives Matrix

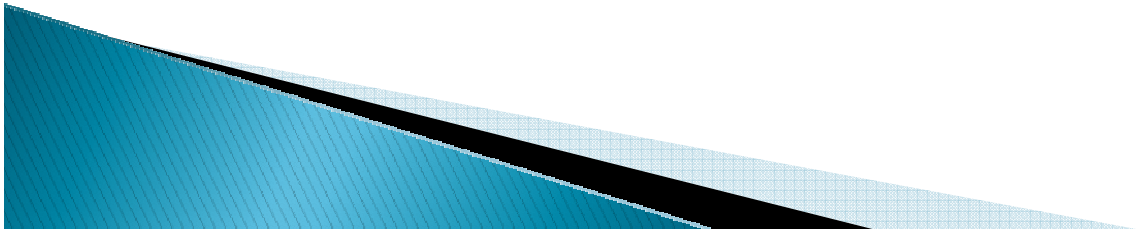
Developed by J. Riggs

Exercises – dr Sanja Marinkovic



Objectives Matrix

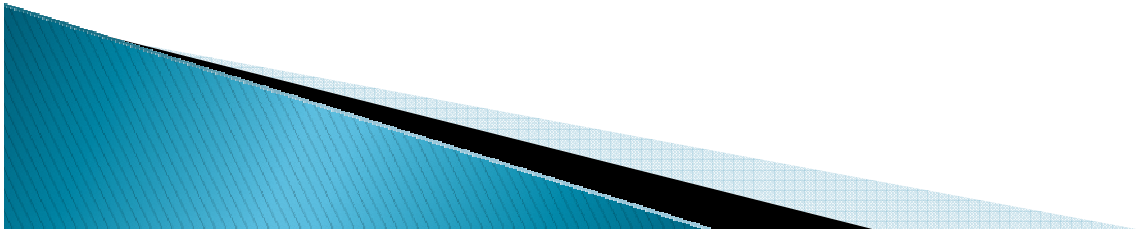
- Method for rating productivity in organization
- Main advantage of this matrix is that both aspects related to productivity – efficiency and effectiveness, can be taken into quantitative consideration by decomposing of overall productivity factors.



Objectives Matrix method

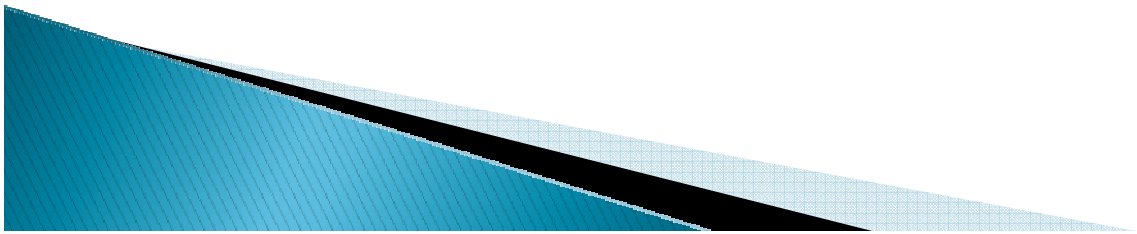
- Simple and general
- Usable in various kind of business

- It can be used for viewing productivity in an organization after introducing new technology.

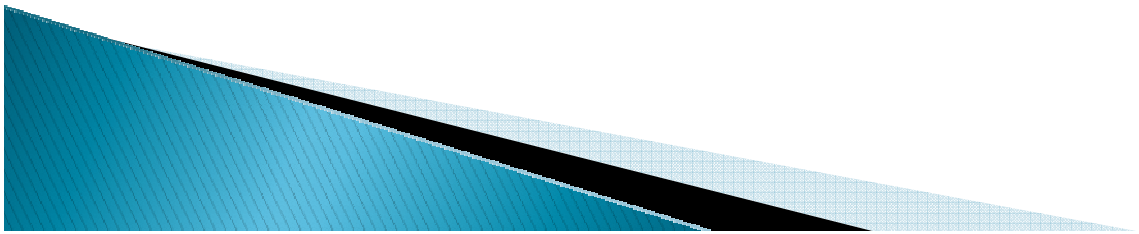


Objectives Matrix

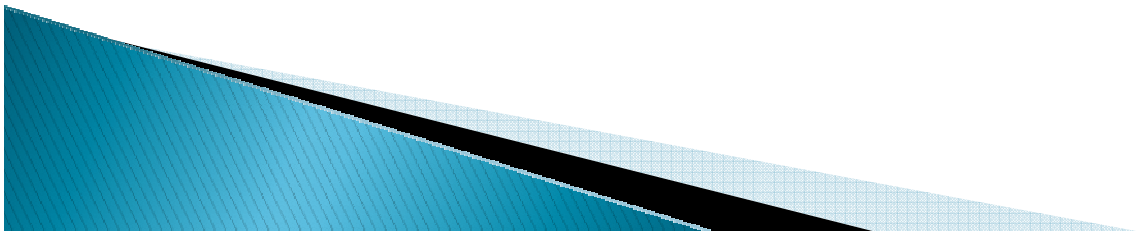
- Objectives Matrix Method was developed to measure productivity in **manufacturing field**.
- Careful selection of productivity factors inside the matrix allows us to apply it successfully to services as well, using all of its advantages for tracking efficiency and effectiveness of providing **services**.



- How to create a Matrix and calculate productivity?

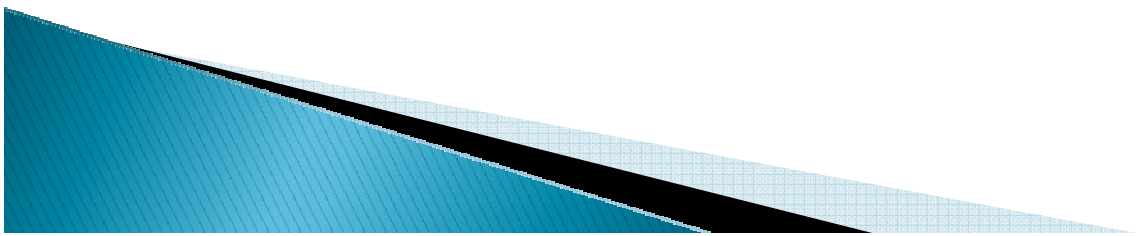


- WE CAN MEASURE PRODUCTIVITY AT DIFFERENT LEVELS
  - COMPANY
  - DEPARTMENT
  - INDIVIDUAL



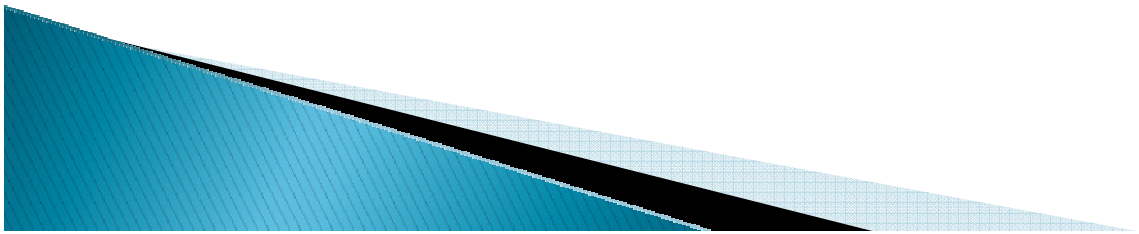
- **At the level of the company**, productivity is fundamental to **profitability and survival,** which means companies with higher productivity than the industry average tend to have higher profit margins.

- **At the personal level**, increasing productivity in one's activities is an important aspect of **self-fulfillment.**



The Objectives Matrix

- This method is comprehensive and very flexible.
- It can be used to derive a composite index for the entire organization or to individual productivity measures.



I1	I2	I3	I4	I5	Indicators
5.0	4.1	75	86	21.3	*Performance*
3.0	2.5	90	95	10.0	**10**
3.5	2.8	89	94	11.2	**9**
4.0	3.1	87	92	12.4	**8**
4.7	3.4	85	90	13.8	**7**
5.4	3.8	83	88	15.4	**6**
6.3	4.2	81	86	17.2	**5**
7.3	4.7	79	84	19.2	**4**
8.5	5.3	77	82	21.3	**3**
10.0	5.9	75	80	23.5	**2**
11.7	6.6	73	78	27.0	**1**
13.5	7.5	70	75	30	**0**
6.6	5.2	2.0	5.0	3.0	*Actual Score*
25	25	30	10	10	*Weights*
165	***130***	***60***	***50***	***30***	*Value*
				Total weighted score	*435*

A

B

C

D

E

F

G

H

Description Of Objective Matrix Components

	NAME	DESCRIPTION
A	Indicator	Indicator is the aspects of measurement. All the aspects taking into account to derive composite index. Each indicator contains the ratio of output into input, (Output/Input) which is basically productivity score for that particular aspect.
B	Score-range	Score-range is some kind of table look up to refer the position of each indicator based on their actual score. The score range are proposed by management staff. In this case the maximum achievement will assign to largest number of score(10) and the worst will tend to have smallest number (0).The formula of construction this palette is: [(Maximum achievement-Minimum achievement)/10]
C	Score	Score is the value of range according to actual score.
D	Actual Index	Actual Index is the exact figure achieved by each indicator based on the calculation of the data.
E	Actual Score	Example: Documentation Index has actual score of 86; based from the palette, the score is 5.
F	Index's Weight	Index's Weight shows the weight of each indicator. This is assigned by management staff based on which ratio they want to emphasize more. Larger number means the aspect is more stressed.
G	Value	Value = (Actual score * Index's weight) = (E * F)
H	Total Weighted Score	Total weighted score = Total value (Value) = Total G

EXAMPLE: Factors chosen for tracking productivity, as indicators of the success of new technology in a given period of time

M.D.D. – meeting delivery deadlines in the given period (%)

F.P. – flexibility of a process, as a number of various technology processes

F.P.S. – flexibility of product/service, as a number of various products/services

G.P. – overall productivity

P.S.P. – manufacturing price of an item, in financial terms

T.L.C. – technology life cycle, as a number of years till full maturity of technology

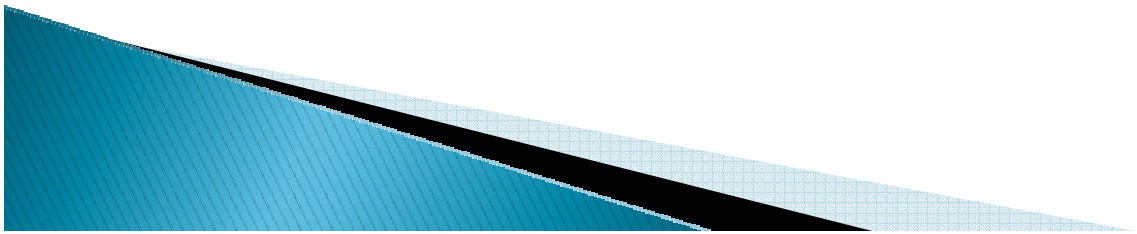


Table 1: Objectives Matrix for rating effectiveness

		EFFECTIVENESS FACTORS					
		M.D.D. (%)	F.P. n. var. proc.	F.P.S. n.var. prod/serv.	Gp (%)	P.S.P. (€)	T.L.C. years to matur.
ESTIMATES	A.V	85%	4	7	120	270	4
	10	100	11	12	180	250	10
	9	98	10	11	170	260	9
	8	96	9	10	160	270	8
	7	94	8	9	150	280	7
	6	92	7	8	140	290	6
	5	90	6	7	130	300	5
	4	88	5	6	120	310	4
	3	86	4	5	110	320	3
	2	84	3	4	90	330	2
	1	82	2	3	80	340	1
	0	80	1	2	70	350	0
ESTIMATE		2.5	3	5	4	8	4
REL. NUMB.		20	30	15	12,5	10	12,5
VALUE		50	90	75	50	80	50
				TOTAL VALUE	395		

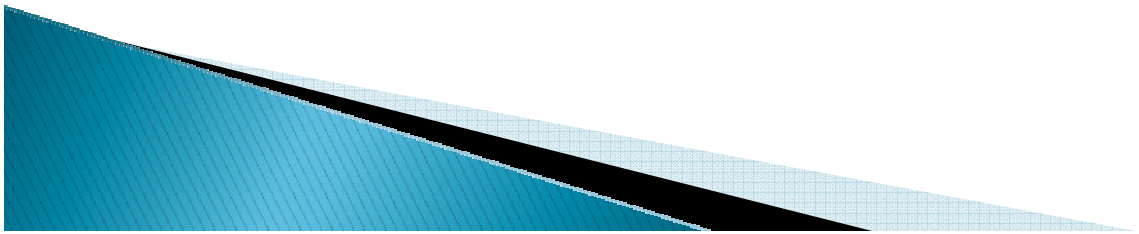
Productivity Calculation

- Basically, when calculating the productivity, it actually happens to be benchmarking between the current performances compared to previous.

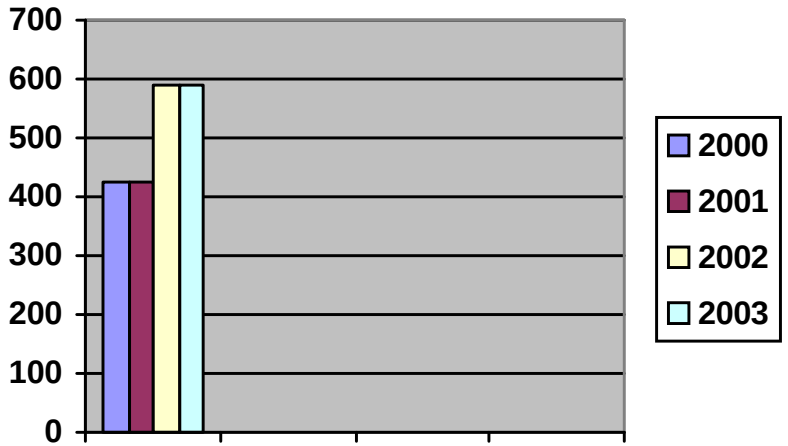
- *Formula:*

$$\text{Productivity Index} = \left(\frac{V_1 - V_2}{V_2} * \right) 100\%$$

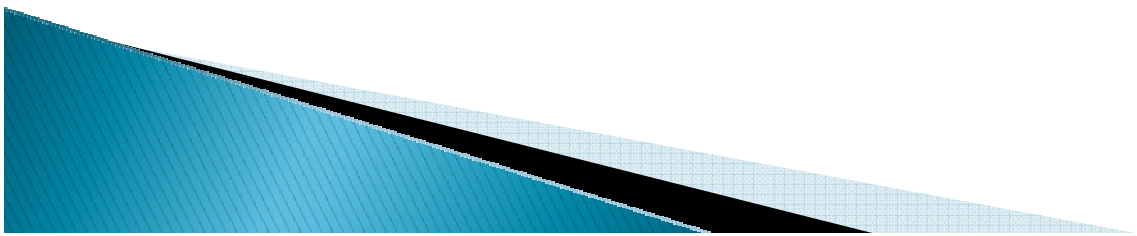
- V_1 = *weighted score for current period*
- V_2 = *weighted score for previous period*



		Te (din/em)	$F_{i/o}$	GP (%)	E (kwh/em)	RD	L	Q	Index of productivity
2000	Values	207675	1.48	391	778	778	4.015	24	424
	Estimates	1	6	6	1	6	3	5	
2001	Values	258078	1.48	258	1.099	193	10.130	27	427
	Estimates	2	7	3	2	1	9	6	
2002	Values	325.586	1.27	330	2.877	998	9.954	27	592
	Estimates	4	3	4.5	6	7	9	6	
2003	Values	387.535	1.32	306	4.440	1.325	4.963	27	589
	Estimates	7.5	3.5	4	9	9	4	6	

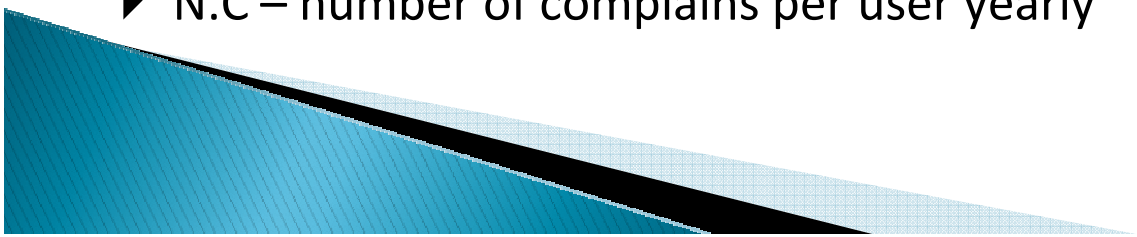


Objectives Matrix in telecommunications – example of a cable TV operator



Cable TV operator

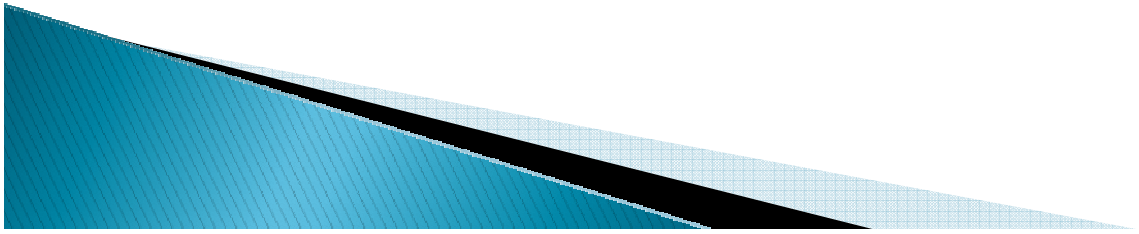
- N.U – number of the cable TV users
- N.I.U – cable Internet users (%)
- C.S –charged services
- B.C – broken contracts (%)
- D.U – disconnected users (%)
- V.M.U – value of material per new user (€)
- T.R.S – time for repairing a signal after a group complain (hours)
- N.C – number of complains per user yearly



		NU	NIU	CS	BC	DU	VMU	TRS	NC	
		*10^3	%	%	%	%		h		
	PERF	**117**	**4.16**	**94.00**	**1.57**	**8.23**	**28.13**	**18**	**1.18**	
	10	150	7.50	100.00	0.00	1	18	0	0.25	
	9	140	7.00	99.50	0.50	2	20	2	0.50	
	8	135	6.50	99.00	1.00	3	22	4	0.75	
	7	130	6.00	98.50	1.50	4	24	6	1.00	
	6	125	5.50	98.00	2.00	5	26	8	1.25	
	5	120	5.00	97.50	2.50	6	28	10	1.50	
	4	115	4.50	97.00	3.00	7	30	12	1.75	
	3	110	4.00	96.00	3.50	8	32	14	2.00	
	2	105	3.50	95.00	4.00	9	34	16	2.25	
	1	100	3.00	94.00	4.50	10	36	18	2.50	
	0	95	2.50	93.00	5.00	11	38	20	2.75	
Score		4.5	3	1	7	3	6	1	6	
Weights		18	16	14	8	8	14	12	10	
Value		81	48	14	56	24	84	12	60	
								Total weighted score 379		

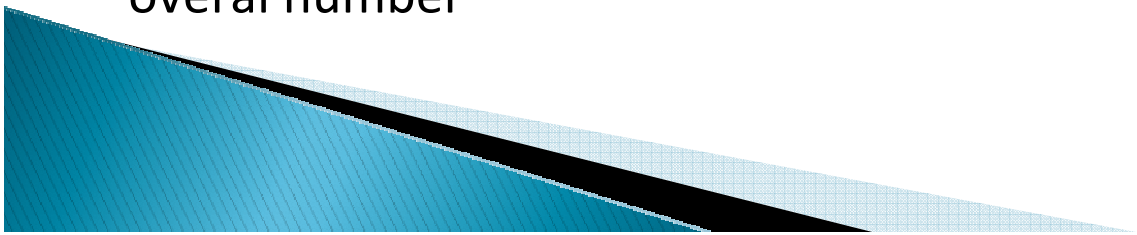
- How to create a Matrix and calculate productivity?

- By using suitable factors, we can determine:
  - The level of technology effectiveness
  - The level of technology efficiency
  - Overall productivity



Factors chosen according to survey conducted in International Head office of Telecom Serbia after new technology introduction

- R.P.D – Percentage of received and processed clients' requirements for a new connection
- R.D – Percentage of rejected requirements from network system to clients
- D.I.U – Delay in implementation of new technology, given in number days from the day of purchase
- U.C – Use of telephone exchange capacity
- T.E – Technical equipment - EUR per employee
- Q.E – Qualification structure, as the number of higher educated staff in overal number

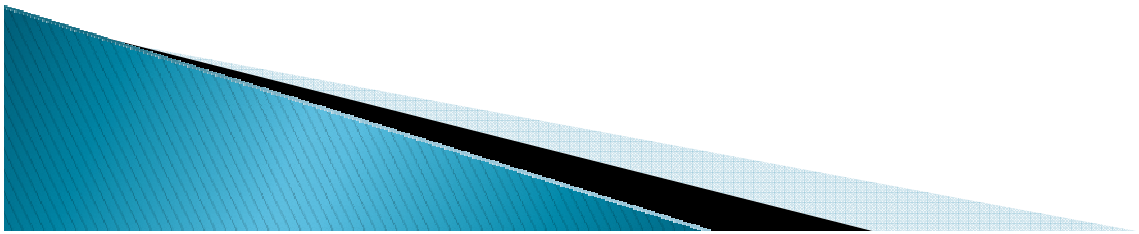


		RPD	RD	DIU	UC	TE	QE
		%	%	(dani)	%	DEM/zap.	%
Score	Perf	85	19	25	82	95500	100
	10	95	5	14	95	100000	95
	9	90	10	17	90	95000	90
	8	85	15	21	85	90000	85
	7	80	20	24	80	85000	80
	6	75	25	28	75	80000	75
	5	70	30	31	70	75000	70
	4	65	35	35	65	70000	65
	3	60	40	38	60	65000	60
	2	55	45	42	55	60000	55
	1	50	50	45	50	55000	50
	0	45	55	49	45	50000	45
Actual score		8	7	7	7	9	10
Weights		17	16	16	22	14	15
Value		136	112	112	154	126	150
Total weighted score				**790**			

Individual productivity measures

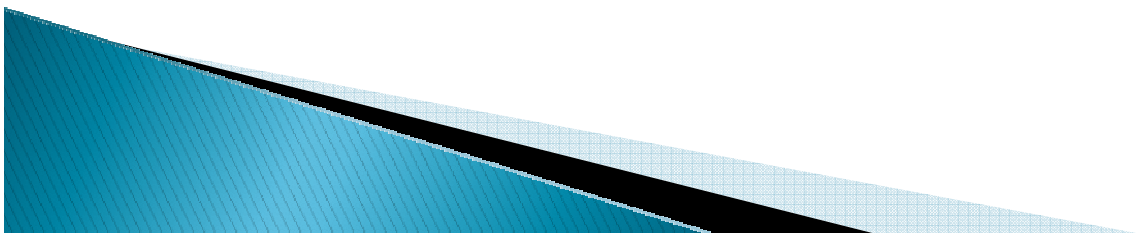
Objectives Matrix measuring an individual mechanic's productivity

Source: Rahman A.A, Ismail N: Designing individual productivity measures in service sector



Methodology of the Study

- The productivity measure is built according to several steps in order to achieve the **objective which is measuring a single mechanic's productivity**, taking into account numerous aspects including attitude and not just measuring their performance in doing their work.



Seven Steps of measurement

- Brinkerhoff and Dressler (1990) have developed the **Seven Steps for productivity measurement** as a guideline to researchers in designing their own productivity measurement.

- The outcome of this design - **productivity indicators**.

- All the indicators will be incorporated using the **Objective Matrix** to produce **one figure** showing the weighted score of overall incorporated ratios.

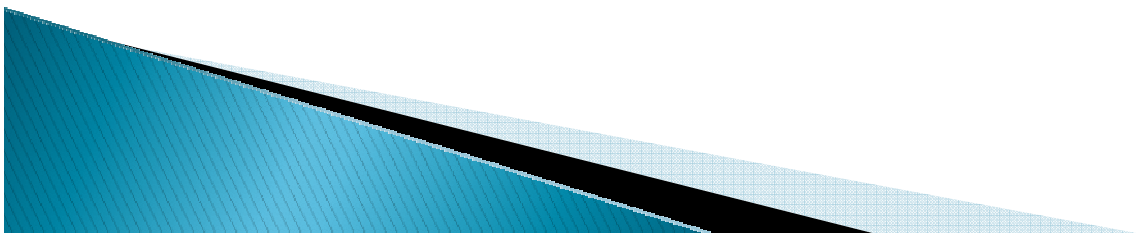
- This figure finally will be calculated and benchmarked with previous productivity score to determine whether it is increasing or decreasing.

Seven Steps of measurement

STEP	STEP NAME	DETAILS
1	Mission Statement	Write the Mission Statement for the unit that identifies the major goals and customer of the unit. The mission statement must be complete and compatible with the mission of the larger organization.
2	Expectations	Identify the unit's services for each customer. Expectation must be clearly identified and explaining quality needs and expectations held by each major customer group for the unit's services.
3	Key Outputs	Identify outputs that are important to the unit's mission, responsive to the customer needs and expectation and account for the majority of the expenditures of the unit's resources.
4	Major Functions	Identify and describe the major functions of the unit. This must clearly represent unit operations and inputs and explain how the key outputs are produced.
5	Output Measurement Selection	Construct measurement techniques for one or more key outputs that will produce the most practical and useful quality and productivity information.
6	Input Measurement Selection	Construct measurement techniques for one or more key inputs that are critical to the production of the outputs selected in Step5.
7	Index Construction	Construct one or more productivity measures to incorporate the output and input measures into a sensitive, practical and useful index.

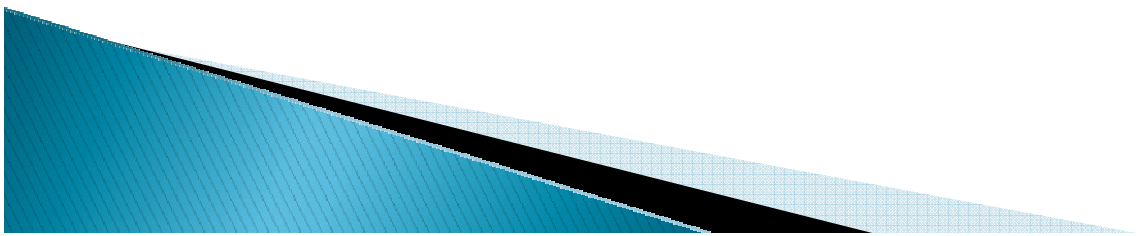
The Maintenance Worker Environment

- A maintenance technician often does **many different jobs** in a single day unlike the production counterpart who does high volume of work
- The maintenance technician has much **longer work cycle** while the production worker has shorter one
- These significant differences led to major problems in early attempts to measure maintenance work



The Maintenance Worker Environment

- There is a bunch of different tasks in each of every skill in maintenance work.
- One of the most difficult activities was applying the standards to the daily maintenance workload
- Another approach is needed to calculate personal productivity that will finally contribute to the overall company's productivity



Productivity Measurement Design

Implementation of Seven Steps

Step 1 – Mission statement

The maintenance worker is responsible for **maintaining and repair of all company's buses** in sufficient time to meet customer needs.

Step 2 – Expectations

- The customer of this workshop is the owner of all the buses. When a bus is sent to maintenance or repair, the **expectation is returning the bus in a good condition and safe** to use.
- On the other hand, the workshop itself has it's own expectation that the fixing and maintaining job can be done during the given time.

❖Step 3 – Key Outputs

1. **Number of buses fixed:** Total number of buses which have been fully maintained/serviced and are starting to operate
2. **Number of buses partially fixed:** Total number of buses that have been serviced but are not complete and cannot operate
3. **Number of buses unfixed:** Total number of buses that have not been fixed at all
4. **Number of complains or returns:** Number of buses that have been fixed and sent to owner, but are returned because of unsatisfying service
5. **Number of the buses in queue:** Sum of the buses that are still waiting to be serviced in a day

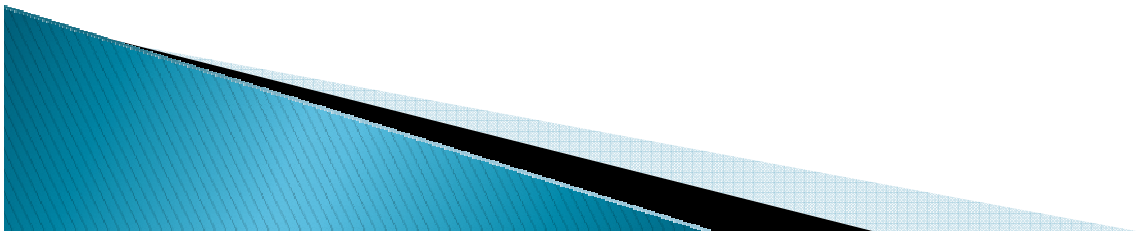
❖Step 4 – Major Functions

List of inputs and throughputs based on the results of the brainstorming session

1. **Key Inputs**
   a) **Labor hours:** Total working hours a day for each mechanic (9h/d)
   b) **Controlled time for each task:** Each task of service has been assigned to a specific controlled time
2. **Throughputs**
   a) **Productive labor hours:** Total time during which the mechanic is productive, committed to work
   b) **Time taken to complete a task:** The actual time taken for mechanic to complete a task
   c) **Overtime hours:** Sum of all hours mechanic has worked out of the defined time

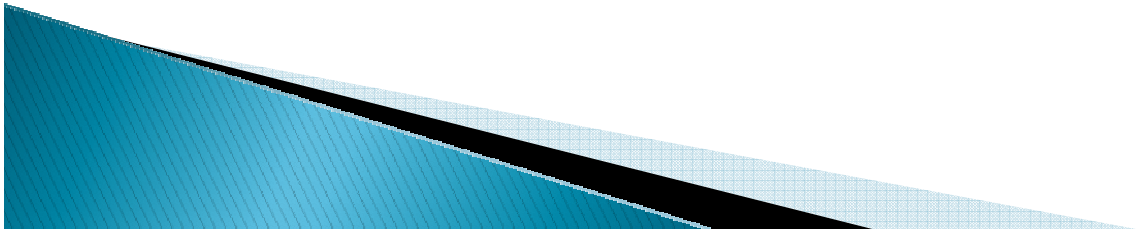
❖Step 5 – Output Measurement Selection

1. Number of buses fixed or partially fixed
2. Number of fixed buses rejected or returned
3. Time taken to complete a task
4. Days absent
5. Overtime hours



❖Step 6 – Input Measurement Selection

1. **Total labor hours**
2. **Number of buses fixed**
3. **Time scheduled for completing a task**
4. **Total man days available**
5. **Straight-time hours** (Straight time means the usual number of hours and the usual amount of pay for a period of work.)



❖Step 7 – Index Construction

Performance of the mechanics

$$\left(\frac{\text{No of Buses (partially) Fixed}}{\text{Total Labor Hours}}\right)$$

Customer satisfaction

$$\left(\frac{\text{No of Fixed Buses Rejected or Returned}}{\text{No of Buses Fixes}}\right)$$

Performance of the mechanics in terms of scheduled time

$$\left(\frac{\text{Time Taken to Complete a Task}}{\text{Scheduled Time}}\right)$$

Attitude of a single mechanic

$$\left(\frac{\text{Days Absent}}{\text{Total Man Days Available}}\right)$$

Duration of the mechanic's work

$$\left(\frac{\text{Overtime hours}}{\text{Straight Time Hours}}\right)$$

Implementation of the Objectives Matrix

1 ***No Of Buses Fixed*** ***Total Labor Hours***	2 ***No Of Rejected/Returned Fixed Buses*** ***No Of Buses Fixed***	3 ***Time Taken To Complete A Task*** ***Scheduled Time***	4 ***Days Absent*** ***Total Man Days Available***	5 ***Overtime Hours*** ***Straight-time Hours***	***Indicators***
0.64	0.30	0.80	0.12	0.09	*Performance*
0	0	0 – 0.2	0	0	**10**
0 – 0.2	0 – 0.1	0.2 – 0.4	0 – 0.1	0 – 0.1	**9**
0.2 – 0.5	0.1 – 0.2	0.4 – 0.6	0.1 – 0.2	0.1 – 0.2	**8**
0.5 – 1.0	0.2 – 0.3	0.6 – 0.8	0.2 – 0.3	0.2 – 0.3	**7**
1 – 2	0.3 – 0.4	0.8 – 1.0	0.3 – 0.4	0.3 – 0.4	**6**
2 – 3	0.4 – 0.5	1.0 – 1.2	0.4 – 0.5	0.4 – 0.5	**5**
3 – 4	0.5 – 0.7	1.2 – 1.4	0.5 – 0.7	0.5 – 0.7	**4**
4 – 5	07 – 0.8	1.4 – 1.6	0.7 – 0.8	0.7 – 0.8	**3**
5 – 6	0.8 – 0.9	1.6 – 1.8	0.8 – 0.9	0.8 – 0.9	**2**
6 – 7	0.9 – 1.0	1.8 – 2.0	0.9 – 1.0	0.9 – 1.0	**1**
Over 7	Over 1	Over 2	Over 1	Over 1	**0**
7	6	7	8	9	*Score*
20	20	40	10	10	*Weights*
140	***120***	***280***	***80***	***90***	*Value*
				Total weighted score	***710***

$$\text{Productivity Index} = \left(\frac{V_1 - V_2}{V_2} \right) * 100\%$$

- V_1 = weighted score this period
- V_2 = weighted score previous period
  - Assume previous period index was 680

$$\text{Productivity Index} = \left(\frac{710 - 680}{680} \right) * 100\% = 4.41\%$$

- Productivity gain of 4.41% has been recorded during the observed period.

Conclusion

- **The Seven Steps of measurement was used in order to design the measurement system**
- **Objectives Matrix was applied in order to incorporate all the productivity indicators that have been constructed**
- **Objectives Matrix can be used in individual measurement as well as in a team measurement because of the multi-factor feature of productivity**
- **Productivity measurement practitioners should be able to develop appropriate measurement system; researchers could use the data for further research**