Problem-Solving and Operational Research Tools to optimize resource allocation

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ABSTRACT

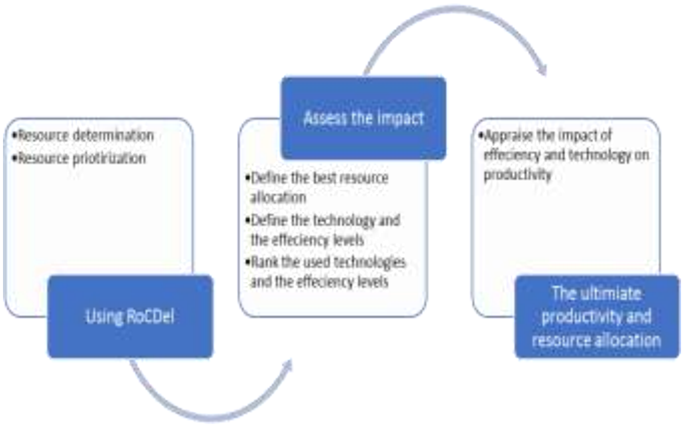
The distribution of resources is a key to the success of a given production process and its maintenance. Indeed, companies can gain a decisive and immediate competitive advantage. We aim to model the allocation of resources in a power type production unit proposing improvements at a later stage. A model: workers, resources, tasks will be adopted as part of our model. Once developed, this model can be the starting point for further optimization efforts for the entire value chain component of any production process. CAPEX: Reduction of operating costs by dynamic elimination of losses. To our previous efforts, we add a problem resolution framework rendering it easier for the user to identify resource importance and resource leakage.

***Keywords:* Allocation, Ressources, Production Unit, Optimization of Resources, Rocdel.**

I INTRODUCTION

In economics, total factor productivity (TFP), also known as multifactor productivity, refers to the part of production that is not explained by the traditional inputs of labor and capital used. in production. [8] If all inputs are taken into account, then total factor productivity can be considered as a measure of the technological change or long-term technological dynamism of an economy.

In this paper we will model the productivity of a production unit. In previous work pieces [9,10,11,12,13,14,15], we have shown that a better resource allocation help the producer get the most of his available capabilities. In this paper, we cover another aspect which is the impact of technology and efficiency om the outcome. Actually, building on previous work, we recommend the next work scheme:



II MODELING

Total factor productivity (TFP) or total factor productivity (TFP) is the relative increase in wealth ("growth") that is not explained by the increase in the use of factors of production, capital and work. For example, sunshine can increase agricultural production, all other factors being constant elsewhere. Sunshine is therefore a factor of productivity.

The production function below (of the Cobb-Douglas constant-scale yield form) [16,17,18,19,20] represents output (Y) as a function of an overall factor productivity factor (A), a capital stock (factor K), labor (factor L), and the respective shares of capital and labor in the final result (α is the share of the contribution of capital).

$$Y = A.K^{\alpha}L^{1-\alpha}$$

Total factor productivity generalization: technology-oriented approach

In this paper we introduce a new model for TFP. In fact, we will describe a broader approach that can be used to simulate the impact technologies have on productivity, and namely on cost, ad to compare them.

Our model assumes to the following:

- The resource allocation has been optimized ([1,2,3,4,5]). Our paper handled this issue with care [1]
- Many technologies exist, and many technologies can be utilized for our convenience
- The main objective is to reduce cost, **with the same resources and to perform the same production**

Our model aim is focused only on unit cost reduction this is **a new way to reduce OPEX** after applying **RocDel** introduced in our previous work [6,7,21].

Indeed, **RocDel** aims to reduce the cost, resource allocation aims to improve the resource utilization, and the model we are presenting aims to reduce the unit cost.

Model Description

We present the model parameters as follows:

Parameter	Description
N	The number of resource units (e.g. workforce, capital, etc.)
C	The cost required
c	Unit cost for each resource unit
$Tech$	A function representing the technology impact on the required resource units to perform the same production

Our model aims to lower cost i.e. C, which can be obtained as follows:

$$C = N \times c$$

The technology permits to get the same production with a different number of resource units (naturally a lower number of units). Thus, after utilizing a technology, for the same production, we will require another number of units N' as follows:

$$N' = Tech(N)$$

Then the new cost C' is given by:

$$C' = N' \times c = Tech(N) \times c$$

Let's compute the ratio $\frac{C'}{C}$:

$$\frac{C'}{C} = \frac{N' \times c}{N \times c} = \frac{N'}{N} = \frac{Tech(N)}{N}$$

The ratio $\frac{Tech(N)}{N}$ gives an idea of **the linearity of the used technology.**

Therefore, we introduce in this paper, **the technology grading concept:**

1. Sub-optimal**,** $Tech: N \to a.N^{\alpha} + b, \alpha < 1$

   That is actually when resource units are under performing. The technology function $Tech$ here can be seen as a **distraction**, or a **limitation** that lower the performance

2. Linear–Manual**,** $Tech: N \to a.N^{\alpha} + b, \alpha = 1$

   That takes place when resources are proportional to outcome; this is a typical case of manual work using no technology, or utilizing rudimentary one.

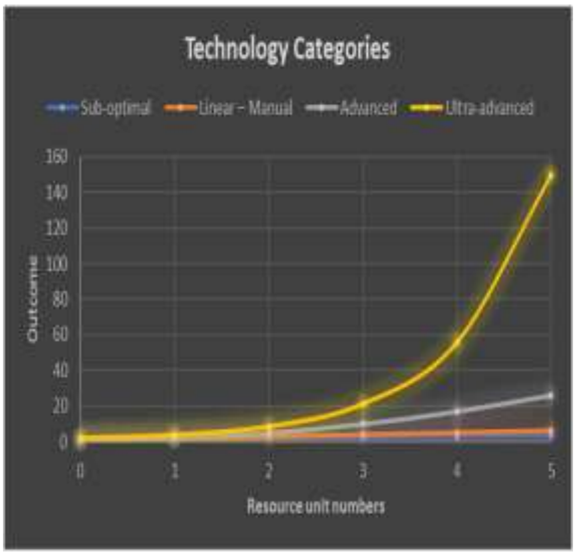
3. Advanced,

   $Tech: N \to a.N^{\alpha} + b, \alpha > 1$

That takes place when you are using well-advanced technologies where resource unit number lead to unproportionally better than outcome; this is a typical case of replacing manual tasks in the value chain by machine through atomization

4. Ultra-advanced, $Tech: N \rightarrow a.e^{\alpha} + b, \alpha > 1$

We present the $Tech$ three categories as follows:



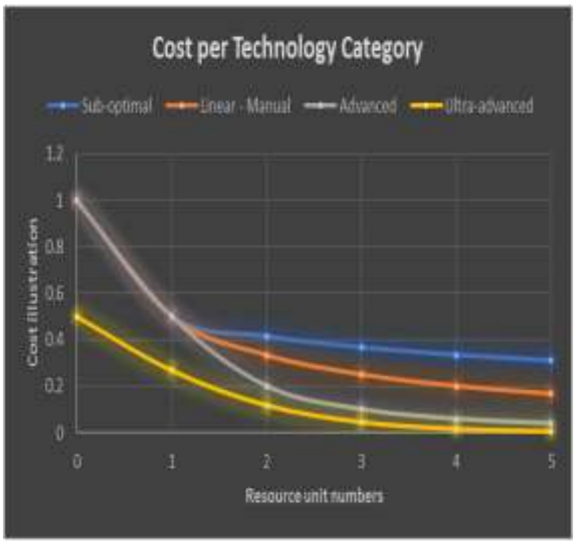


Figure 1: Technology Categories **Figure 2: Technology Cost Impact**

We illustrate the impact on cost as follows:

The suggested scheme can be utilized to guide technology selection accounting for its impact on cost reduction.

III CONCLUSION

In this work, we modeled the technology impact on required resources, and thus cost. We observe the more the technology is advanced, the best is the impact on cost reduction. The reduction can be dramatic if the technology is “smart enough” to involve in an auto-improvement process.

A further step of the research work is to draw a through financial assessment by including the cost of the technology, its lifetime, and its amortization. That can have a significant impact on mega-projects, especially if considered at the establishment.

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