

DEFINITION 3

The forces that influence the intensity of the innovation and generate the causes of the economic impact of technological innovation within the economic system can be reduced to two variables:

a (adopters) = number of innovation adopters (people, firms, institutions, etc.)
 w (welfare and utility) = utility of users and social welfare

REMARK 2. In the present approach, the first variable (adopters) is fixed and unique for all technological innovations, while the second which measures the *welfare* and *utility* will be different according to the type of innovation.

Table 4- Examples of variables of the model

Technological Innovations	First variable	Second variable
Farm tractors	Adopters	- Productivity per acre - Labour saving per acre, ect.
Catalytic muffler	Ibidem	- To decrease of the pollution - To decrease of pulmonary disease and cancer, etc.
Medicine	Ibidem	- Lifespan
Internet	Ibidem	- Time reduction of the communication or for searching information - To increase employment in ICT industries, etc.

DEFINITION 4

The function of the economic impact of the innovation or innovative impact is defined by the following equation:

Welfare of the innovation = $f(\text{adopters})$;
 $w = f(a)$, such that
 $w: \mathfrak{R} \rightarrow \mathfrak{R}$ positive and continuous.

DEFINITION 5

Let $w = f(a)$ the function of economic impact of the technological innovation, such that $w: \mathfrak{R} \rightarrow \mathfrak{R}$ positive and continuous in $[0, \xi]$, the MAGnitude of TEchnological CHange (MATECH) is defined as:

$$MATECH := \text{Log}_{10} \int_0^{\xi} f(a) da \quad MATECH \in \mathfrak{R}^+$$

which supplies the area of dimensions ξ and $f(a)$.

- The MATECH in the case of a function with two (real) variables

If we consider two independent variables, for example adopters (a) and time (t) the function of the economic impact of the innovation is $w = f(a, t)$ such that $w: A \subseteq \mathfrak{R}^2 \rightarrow \mathfrak{R}$ positive and continuous in A , limited and closed set; with reference to a system of Cartesian axis $Oxyz$ the function geometrically represents a surface S which will all be above the plane xy . If A is the set of the plane thus defined:

$$A = \{(x, y): 0 \leq x \leq \xi, 0 \leq y \leq v\}$$

where ξ is the number of adopter, v is the time of technological evolution, MATECH is defined as:

$$MATECH = \text{Log}_{10} \int_0^{\xi} \int_0^v f(a, t) da dt \quad MATECH \in \mathfrak{R}^+$$

which supplies the volume of dimensions ξ, v and $f(a, t)$.

- Generalisation in a space with n -dimensions

If we consider a multidimensional function (since there are many variables that can affect the economic impact of the innovation, $x_1, x_2, \dots, x_n$), the function of economic impact of the innovation will be of type $w: A \subseteq \mathfrak{R}^n \rightarrow \mathfrak{R}$ positive and continuous in A , limited and closed set. In a space with n dimensions, the function describe a hyperplane and the MATECH is thus defined:

$$MATECH := \text{Log}_{10} \int \dots \int_A f(x_1, x_2, \dots, x_n) dx_1 dx_2, \dots, dx_n$$

$$MATECH \in \mathfrak{R}^+$$

which provide the volume under the hyperplane.

REMARK 3. The above approach calculates the innovative intensity on the basis of the area underlying the function of the innovative impact.

The second query we posed, was the graduation of the various innovations in order to show the power propagated in the economic environment, which leads to the following proposition.