THE INFORMATIONAL CONTRIBUTION OF VARIED INFLUENCES ON THE DECISION IN THE ANIME CULTURE E-MARKETING

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Abstract
After 1989, we are witnessing a cultural phenomenon in Romania, namely the penetration of a culture revolving around the Japanese animation, commonly referred to as "anime", *and the Japanese manga comics, called the "anime culture", or otaku culture. Once this culture was assimilated, we later witness the opening of a new entertainment market in Romania, the anime culture market.*
The promotion and acquisition of the products of this culture is done at this time, almost entirely by electronic means. For this reason, I consider verry important the study of the influencing factors with impact in the context of e-marketing of the anime culture products.

Key words: information entropy, information energy, anime, manga

1. Introduction

After 1989 we observe, in Romania, the penetration of a culture of Japanese origin that revolves around the Japanese animation, commonly referred to as "*anime"*.The persons who adopt this culture, namely the anime fans or otaku will show his cultural affiliation by purchasing anime merchandise.

The anime was first localised in the United States, by subtitling or dubbing and when Romania came in contact with the american culture it came in contact with the anime or otaku culture also, a culture which was allready established in the United Stated during the '80s.

Immediately after the 1989 Revolution, the Romanian Television(TVR) began broadcasting films and anime series. Some examples are the feature films "*Pheonix Firebird"* and "*Windaria"*, alongside the series: "*Sandi Bell"*, "*Candy Candy"*, "*Macron 1"*, "*Saber Rider"*, "*Sailor Moon"* and others.

The rising interest of the Romanians for anime made the Romanian television broadcast even animes spoken in Japanese, subtitled in Romanian. Afterwards, the Romanian TV (*TVR*) example is also followed by *Antena 1* and *ProTV*, which broadcast subtitled or dubbed world-famous anime series such as *Pokemon*, *Dragonball*, and many other anime series like *Inuyasha*, *Samurai X* (*Runoni Kenshin*), *Full Metal Alchemist*, *Evangelion*, *Full Metal Jacket* and many more.

In the early 2000s, as a result of the broad audience that the anime had enjoyed until then, appeared *A+*, the television channel specialized in the broadcasting of anime, which was later replaced with *Animax*.

As a result of the large number of anime fans and the development of the electronic communication means in Romania in 2007, there is the first anime-specific convention in Bucharest called “*Nijikon”*.

This convention, which has been held annually since that year, gathers annually with thousands of participants, of whom we mention, exhibitors of anime products, visitors and cosplayers.

As a result of the success of this convention, similar events like Otakufest took place.

With the passage of televisions into virtual space and the development of the facebook social networking, the promotion of anime-specific events such as conventions and the sale of the anime products takes place entirely in the virtual space of the Internet. Nowadays, the freshest information about anime in Romania is found on facebook discussion groups on anime.

The most important and great group of discussions in Romania with anime theme is “*Anime Romania”*, which currently has over 20,000 members followed by “*Anime is my world and your world”* and many others.

On these discussion groups, we launched a survey to study the influence of several factors, which we will analyze from the perspective of information theory.

2. Basic notions of information theory

For the present study, we will use the data inserted in the following table:

Table 1

Basic information (source: the author own research)

X variable (age)	Y variable (anime products)		TOTAL
	Y_1= subtitled	Y_2=derived	
X_1 (age < 25 years)	260	368	733
X_2(age > 25 years)	8	46	91
TOTAL	410	414	824

The dimensions to be used in analyzing data from an informational point of view are: **information energy** and **informational entropy**, dimensions that characterize the influence exerted by the variables of a decision-making process. We will agree that the variables of interest are positioned vertically, having two alternatives in this example. It's about variable "*anime products*" with attributes / alternatives: “*subtitled anime-products”* respectively “*relative products”* of this culture. The results are obtained by the author, following a study, in the form of an internet survey. The questionnaire (Cazacu, 2016), addressed to the participants at the discussion groups related to the anime culture, to the marketing of its derived products and to the subtitling preferences of these fans. The characteristics of the target group were the biological gender and the age. Thus, the segmentation variable will be considered ***X***= the age, with two levels compared to the limit of 25 years, and the variables of interest ***Y***=the anime products, that is the preference for the subtitled products(***Y_1)***, respectively the preference for derivatives of this kind of animation(***Y_2)*** , all expressed in Table no.1, in this first step, by the absolute frequencies of the recorded replies during the survey.

The present goal is to study the interactions between these variables, ultimately, the significant influence on the consumer's decision.

In order to use the marginal probabilities, estimated by the relative frequencies, the following formulas are used (Table 1)

$$\begin{array}{lll} & & p(x_{11})=\frac{x_{11}}{T_{..}}=\frac{365}{824} \\ p(X_1)=\frac{T_{1.}}{T_{..}}=\frac{733}{824} & p(Y_1)=\frac{T_{.1}}{T_{..}}=\frac{410}{824} & p(x_{12})=\frac{x_{12}}{T_{..}}=\frac{368}{824} \\ p(X_2)=\frac{T_{2.}}{T_{..}}=\frac{91}{824} & p(Y_2)=\frac{T_{.2}}{T_{..}}=\frac{414}{824} & p(x_{21})=\frac{x_{21}}{T_{..}}=\frac{45}{824} \\ & & p(x_{22})=\frac{x_{22}}{T_{..}}=\frac{46}{824} \end{array} \tag{1}$$

which forms the probabilities matrix:

$$P(X,Y)=\begin{bmatrix} \frac{365}{824} & \frac{368}{824} & \frac{733}{824} \\ \frac{45}{824} & \frac{46}{824} & \frac{91}{824} \\ \frac{410}{824} & \frac{414}{824} & 1 \end{bmatrix}=\begin{bmatrix} 0,443 & 0,4466 & 0,8895 \\ 0,0546 & 0,0558 & 0,1104 \\ 0,4975 & 05024 & 1 \end{bmatrix} \tag{2}$$

$$P(X/Y)=\begin{bmatrix} \frac{365}{410} & \frac{368}{414} \\ \frac{45}{410} & \frac{46}{414} \end{bmatrix}=\begin{bmatrix} 0,8900 & 0,8888 \\ 0,1097 & 0,1111 \end{bmatrix}$$

$$P(Y/Y)=\begin{bmatrix} \frac{365}{733} & \frac{368}{733} \\ \frac{45}{91} & \frac{46}{91} \end{bmatrix}=\begin{bmatrix} 0,4979 & 0,5020 \\ 0,4945 & 0,5054 \end{bmatrix}$$

with the conventional notations: $p(X_i)/(Y_j)=p(x_{ij})/p(Y_j)$; $p(Yj)/(Xi)=p(x_{ij})/p(X_i)$ (1’)

According to the specialised literature, the amount of information, resulting from an alternative (***X****i* of the variable ***X***) will be calculated in bits (logarithm with base 2):

$$I(X_i)=-log_2 p(X_i)\Rightarrow \begin{array}{l} \mathbf{I(X_1)}=-log_2\frac{733}{824}=\mathbf{0,168933} \\ \mathbf{I(X_2)}=-log_2\frac{91}{824}=\mathbf{3,1979} \end{array} \tag{3}$$

or nits (from the name of the Neperian logarithm):

$$I(X_i)=-lnp(X_i),\quad i=1,2 \tag{4}$$

Similarly, the amount of information arising as a result of alternative (***Y***i of the variable ***Y***), will be, in this example, the following:

$$I(Y_i)=-log_2 p(Y_i)\Rightarrow \begin{array}{l} \boldsymbol{I(Y_1)=-log_2\frac{410}{824}=1{,}007} \\ \boldsymbol{I(Y_2)=-log_2\frac{414}{824}=0{,}993} \end{array} \tag{5}$$

The variable **X** representing young people under 25 years of age or over 25 years, it can be provided as a vector, or in the context of the probability theory, in the form of a distribution as follows:

$$X:\begin{pmatrix} X_1 & X_2 \\ p(X_1) & p(X_2) \end{pmatrix} \tag{6}$$

having the *average:*

$$M(X)=\sum_{i=1}^{2} X_i\cdot p(X_i)=733\cdot\frac{733}{824}+91\cdot\frac{91}{824}=662{,}0464 \tag{7}$$

In order to characterize the states of the variable **X** that are X_1 şi X_2 respectively, we have evaluated the quantities of information associated with each of them, which led us to the "*informational*" distribution ***DI(X)***:

$$DI(X):\begin{pmatrix} I(X_1) & I(X_2) \\ p(X_1) & p(X_2) \end{pmatrix} \tag{8}$$

with the *average*:

$$\begin{aligned} \overline{DI(X)}&=M(DI(X))=\sum_{i=1}^{2} I(X_i)\cdot p(X_i)=-\sum_{\boldsymbol{i=1}}^{\boldsymbol{2}}\boldsymbol{p(X_i)\cdot log_2 p(X_i)}= \\ &=\boldsymbol{H(X)}=0{,}8895\cdot 0{,}1689+0{,}1104\cdot 3{,}17919=\boldsymbol{0{,}5012\cong 0{,}5} \end{aligned} \tag{9}$$

representing the "*informational entropy"* of the variable ***X***, or the degree of "*disorder*" or "*disorganization*" of the studied variable, noted, as we see, with ***H (X).*** Similarly, we shall calculate the entropy for ***Y(anime products)*****,** with its two attributes:

$$\begin{aligned} \boldsymbol{\overline{DI(Y)}}&\boldsymbol{=M(DI(Y))=\sum_{j=1}^{2} I(Y_j)\cdot p(Y_j)=-\sum_{j=1}^{2} p(Y_j)\cdot log_2 p(Y_j)=} \\ &\boldsymbol{=H(Y)=0{,}4975\cdot 1{,}007+0{,}5024\cdot 0{,}993=0{,}501+0{,}499=1} \end{aligned} \tag{10}$$

The characterization of the informational variable can be done in an equivalent way also by another dimension, namely: "*informational energy Onicescu*", whose formula, for the variable **X**, becomes:

$$\begin{aligned} \boldsymbol{E(X)}&=\sum_{i=1}^{n} p^2(X_i)=\sum_{i=1}^{2} p^2(X_i)=p^2(X_1)+p^2(X_2)= \\ &=\left(\frac{733}{824}\right)^2+\left(\frac{91}{824}\right)^2=0{,}8895^2+0{,}1104^2=0{,}8033\cong\boldsymbol{0{,}8} \end{aligned} \tag{11}$$

where: ***n*** = number of lines, respectively states of variable ***X***.

Similarly, for the ***Y*** variable, representing the anime products, and also having two alternatives, the energy of the set is:

$$\mathbf{E(Y)} = \sum_{i=1}^{m} p^2(Y_i) = \sum_{i=1}^{2} p^2(Y_i) = p^2(Y_1) + p^2(Y_2) = \left(\frac{410}{824}\right)^2 + \left(\frac{414}{824}\right)^2 = \frac{410^2 + 414^2}{824^2} = 0{,}500011.. \cong \mathbf{0{,}5} \qquad (12)$$

where: ***m*** = number of columns, respectively states of variable ***Y****.*

Thus, the transfer of information can be appreciated either by using the information energy (***E***) or the informational entropy (***H***). It is observed the inverse proportionality of the two quantities: the energy information and the information entropy.

For the following calculations we will consider::

a) When analyzing the set ***Y***, the absolute frequencies on the columns, these are denoted y_{i1}, y_{i2}, …/ x_{i1}, x_{i2}, …, and the totals on columns with Y_1, Y_2,…

b) When analyzing the ***X*** set, the absolute frequencies on the lines are denoted x_{1j}, x_{2j}, …., and the totals of the lines with X_1, X_2,…

3. Table analysis for the *Y* set

Cramer's V coefficient: (Table 2)

$$\mathbf{V} = \frac{y_{11} \cdot y_{22} - y_{12} \cdot y_{21}}{\sqrt{T_{1.} \cdot T_{2.} \cdot T_{.1} \cdot T_{.2}}} = \frac{365 \cdot 46 - 368 \cdot 45}{\sqrt{733 \cdot 91 \cdot 410 \cdot 414}} = \frac{230}{\sqrt{11322167220}} = \frac{230}{106405{,}7287509} = \mathbf{0{,}00216154} \qquad (13)$$

Table 2

Informational theory analyses (source: the author own research)

Variable X(the age)	**Variable Y (the anime products)**		**TOTAL**	***Asociassion***
	Y_1=prod. subtitled	**Y_2=related products**		
X_1 = sub 25 ani	**365**	**368**	**733**	**0.0021**
X_2 = peste 25 ani	**45**	**46**	**91**	
TOTAL	**410**	**414**	**824**	
Probabilities	**Chance of subtitling preferance**	**Chance of related products preferance**	**Chance of anime products preferance**	**Differencies**
Y_{i1}/Y_1, $T_{.1}/T_{..}$	**0,8902**	**0,8888**	**0,8895(<25)**	
Y_{i2}/Y_2, $T_{.2}/T_{..}$	**0,1097**	**0,1111**	**0,1104(>25)**	
W_j(extrinsic importance specific heaviness), $Y_j/824$, $T_{..}/824$	***W_1*=0,4975**	***W_2*=0,5024**	**≈1**	
$H(Y_j) = -\Sigma p(y_{ij}) \log p(y_{ij})$ (***entropy***)$_{j=1 \vee 2}$	***$H(Y_1)$*= =0,499138**	***$H(Y_2)$*= =0,503352**	**$S_{H(Y)}$≈1**	

$Ea(Y_j)=2E(Y_j)-1$ (informational adjusted energy Onicescu)	***$Ea(Y_1)=0,609$***	***$Ea(Y_2)=0,605$***	***$S_{Ea(Y)}\approx 1,214$***	**Great quantity of information for the attributes**
$R_H(Y_j)=(1-H(Y_j)/(2-S_{H(Y)})=$ intrinsic importance, using the informational Entropy	***$R_H(Y_1)=0,501$ $\approx 0,5$***	***$R_H(Y_2)=0,497$***	**≈ 1**	
$R_E(Y_j)=Ea(Y_j)/S_{Ea(Y)}=$ intrinsec importance, using the informational Energy	***$R_E(Y_1)=0,503$ $\approx 0,5$***	***$R_E(Y_2)=0,497$***	**≈ 1**	
$I_G=\Sigma W_j R(Y_j)/\Sigma W(Y_j)$ =Global importance	***$I(Y_1)=1,007$***	***$I(Y_2)=0,993$***	***$I_G=0,4996\approx$ $\approx 0,5$***	
$I_a(Y_j)=I(Y_j)/I_G=$ adjusted importance	***$I_a(Y_1)=0,0156$***	***$I_a(Y_2)=1,9875$***		
$E(Y_j)=\Sigma (Y_{ij}/Y_j)^2=$ intrinsic Energy /not adjusted	***$E(Y_1)=0,8046$***	***$E(Y_2)=0,8025$***		
$CI=\Sigma Wj\ Ea(Y_j)/\Sigma Wj=$ =informational profit/gain	**0,605≈60%**	**POWERFULL**		
Informational correlation / K coefficient	***$K(Y_1,Y_2)=C(Y_1,Y_2)/(E(X/Y_1)\cdot E(X/Y_2))^{1/2}$ =0,99875(relation)***			

Because 0,00216154 <0,12, it results that, for those two variables analyzed(the anime products and the age) the association is not conclusive. The calculation of the intrinsic importance for the attributes ***Y1***, ***Y2***, using the informational entropy (basically, loss of information), uses the most recent results and is calculated according to the formula:

$$\mathbf{R(Y1)} = (1 - H(Y1))/(2 - H(T)) = (1 - 0,499)/(2 - 1) = \mathbf{0,501}$$
$$\mathbf{R(Y2)} = (1 - H(Y2))/(2 - H(T)) = (1 - 0,503)/(2 - 1) = \mathbf{0,497} \qquad (14)$$

where:

$$\mathbf{H(Y_1)} = -\sum_{i=1}^{n=2} p(x_{i1})\cdot \log_2 p(x_{i1}) = -\left(\frac{365}{824}\cdot \log_2 \frac{365}{824} + \frac{45}{824}\cdot \log_2 \frac{45}{824}\right) = \mathbf{0,499}$$
$$\mathbf{H(Y_2)} = -\sum_{i=1}^{n=2} p(x_{i2})\cdot \log_2 p(x_{i2}) = -\left(\frac{368}{824}\cdot \log_2 \frac{368}{824} + \frac{46}{824}\cdot \log_2 \frac{46}{824}\right) = \mathbf{0,503} \qquad (14')$$

The intrinsic energy, on the other hand, is calculated for the ***Y*** variable, having two alternatives, $\boldsymbol{Y_1}$ and $\boldsymbol{Y_2}$, each alternative having two forms, corresponding to the two segments of population (under and over 25 years): The energies obtained are: ***E*** **($\boldsymbol{Y_1}$) = 0,8046**, respectively **:** ***E*** **($\boldsymbol{Y_2}$) = 0,8025**. We can then calculate the adjusted information energies of the two qualities for the ***Y*** variable**.** Calculating the *"intrinsic importance"* using the *"adjusted energy information":* (Table 2)

$$\begin{aligned}
&\boldsymbol{E(Y_1)} = \sum_{i=1}^{n=2} \frac{x_{i1}}{x_1}^2 = \frac{365^2 + 45^2}{410^2} = \boldsymbol{0{,}8046;}\\
&\boldsymbol{E(Y_2)} = \sum_{i=1}^{n=2} \frac{x_{i2}}{x_2}^2 = \frac{368^2 + 46^2}{414^2} = \boldsymbol{0{,}8025}\\
&\boldsymbol{E_a(Y_1)} = 2 \cdot E(Y_1) - 1 = \boldsymbol{0{,}609}\\
&\boldsymbol{E_a(Y_2)} = 2 \cdot E(Y_2) - 1 = \boldsymbol{0{,}605}\\
&\boldsymbol{S_{Ea}} = \boldsymbol{1{,}014}(sum)
\end{aligned} \tag{15}$$

from of which it results:

$$\begin{aligned}
&\boldsymbol{R(Y1) = Ea(Y1)/\ S_{Ea} = 0{,}503}\\
&\boldsymbol{R(Y2) = Ea(Y2)/S_{Ea} = 0{,}497}
\end{aligned} \tag{15'}$$

Calculation of "*global importance"* using entropy: (Table 2)

$$\boldsymbol{I_G} = \frac{\sum_{j=1}^{m} W(Y_j) \cdot R(Y_j)}{\sum_{j=1}^{m} W(Y_j)} = \frac{0{,}4975 \cdot 0{,}503 + 0{,}5024 \cdot 0{,}497}{1} = \boldsymbol{0{,}4996} \tag{16}$$

$$W(Y_1) = \frac{T_{.1}}{T_{..}} = \frac{410}{824} \qquad W(Y_1) = \frac{T_{.2}}{T_{..}} = \frac{414}{824}$$

We recall the unadjusted informational importance of the attributes $\boldsymbol{I(Y_1)}$ =1,007 and $\boldsymbol{I(Y_2)}$=0,993. We will calculate the adjusted importance of the two attributes, referring to the overall importance: (Table 2)

$$\begin{aligned}
&\boldsymbol{I_a(Y_1)} = \frac{I(Y_1)}{I_G} = 1{,}007/0{,}4996 = \boldsymbol{2{,}0156};\\
&\boldsymbol{I_a(Y_2)} = \frac{I(Y_2)}{I_G} = 0{,}993/0{,}4996 = \boldsymbol{1{,}9875}
\end{aligned} \tag{17}$$

The adjusted global importance leads to the conclusion that the two qualities investigated, the subtitling and the origin of the achieved products from the northern culture, are of the same importance.

To calculate the informational gain, we will remember the results of the adjusted energies, noticing that the information energy of the ***Y*** variable, in the presence of ***X***, is significant. ($\boldsymbol{E_a(Y_1)}$=*0,609*> $\boldsymbol{E_a(Y_2)}$**=** *0,605*).

The *"informational gain"* for the correct decision, based on the importance of ***Y*** attributes / characteristics is: (Table 2)

$$\boldsymbol{CI} = \frac{W_1 \cdot E_a(Y_1) + W_2 \cdot E_a(Y_2)}{W_1 + W_2} - E(Y) = \frac{0{,}4975 \cdot 0{,}609 + 0{,}5024 \cdot 0{,}605}{1} - 0{,}5 = \boldsymbol{0{,}1069} \tag{18}$$

where: $\boldsymbol{W_1}$=0,4975 and $\boldsymbol{W_2}$=0,5024.

The information energies of ***X* on the alternative structures** of ***Y***, are calculated as following:

$$\begin{aligned} \boldsymbol{E(X/Y_1)} &= \sum_{i=1}^{2} \left(\frac{x_{i1}}{T_{.1}}\right)^2 = \sum_{i=1}^{2} p^2(X_i/Y_{j=1}) = \frac{365^2 + 45^2}{410^2} = \boldsymbol{0{,}8046} \\ \boldsymbol{E(X/Y_2)} &= \sum_{i=1}^{2} \left(\frac{x_{i2}}{T_{.2}}\right)^2 = \sum_{i=1}^{2} p^2(X_i/Y_2) = \frac{368^2 + 46^2}{414^2} = \boldsymbol{0{,}8025} \end{aligned} \tag{19}$$

where: $$E(X/Y) = \begin{pmatrix} E(X/Y_1) & E(X/Y_2) \\ p(Y_1) & p(Y_2) \end{pmatrix} \tag{20}$$

or, in other words, the mean energy of the variable ***X* reported to the alternatives** of the ***Y*** variable. From the above results the size of the *average energy*:

$$\begin{aligned} \overline{\boldsymbol{E(X/Y)}} &= \sum_{j=1}^{2} p(Y_j) \cdot E(X/Y_j) = \frac{410}{824} \cdot 0{,}8046 + \frac{414}{824} \cdot 0{,}8025 = \\ &0{,}4975 \cdot 0{,}8046 + 0{,}5024 \cdot 0{,}8025 = 0{,}4002 + 0{,}4032 = \boldsymbol{0{,}8034} \end{aligned} \tag{21}$$

The correlation coefficient ***C (Y1, Y2)*** is calculated using the formula: (Table 2)

$$\boldsymbol{C(Y_1,Y_2)} = \sum_{i=1}^{m=2} \frac{y_{i1}}{T_{.1}} \cdot \frac{y_{i2}}{T_{.2}} = \frac{365}{410} \cdot \frac{368}{414} + \frac{45}{410} \cdot \frac{46}{414} = \frac{136390}{169740} = 0{,}8 \tag{22}$$

By substituting in the expression of the **K** correlation coefficient, we obtain:

$$\begin{aligned} \boldsymbol{K(Y_1,Y_2)} &= \frac{C(Y_1,Y_2)}{\left((E(X/Y_1)) \cdot (E(X/Y_2))\right)^{1/2}} = \frac{0{,}8067}{(0{,}8046 \cdot 0{,}8025)^{1/2}} \\ &= \frac{0{,}8035}{0{,}80355} = \boldsymbol{0{,}9999} > 0{,}977 \Rightarrow \text{"(K) relation"} \end{aligned} \tag{23}$$

which demonstrates the information link and therefore the importance of the attributes ***Y₁, Y₂.*** (Table 2)

4. The analysis of the influences using the informational statistics

We will use the same data as in the previous paragraph, obtained from the author's online survey. (Table 1) (Cazacu,2016)

We will study the influences of the entities involved in the research results, both with and each other, and about their decisional importance for the marketing phenomenon of the anime culture products.

We keep the previous denotes: ***X*** **-** the age variable (for anime fans surveyed) and ***Y*** - the representative variable for the anime products, more precisely, for the quality of the subtitles and the purchase or preference of the anime derivatives.

The total energy of the set ***Y*** over the structures of the alternatives of the variable ***X*** is defined by the formula:

$$\boldsymbol{E(Y/X_{\backslash})} = \sum_{i=1}^{n=2} E(Y/X_i) = \sum_{i=1}^{2}\sum_{j=1}^{2}\left(\frac{x_{ij}}{T_{i.}}\right)^2 = \left(\frac{365}{733}\right)^2 + \left(\frac{368}{733}\right)^2 + \left(\frac{45}{91}\right)^2 + \left(\frac{46}{91}\right)^2 = \boldsymbol{1} \quad (24)$$

and of the set ***X*** over the structures of the alternatives of the variable ***Y***, by the formula:

$$\boldsymbol{E(X/Y)} = \sum_{j=1}^{m=2} E(X/Y_j) = \sum_{j=1}^{2}\sum_{i=1}^{2}\left(\frac{x_{ij}}{T_{.j}}\right)^2 = \left(\frac{365}{410}\right)^2 + \left(\frac{45}{410}\right)^2 + \left(\frac{368}{414}\right)^2 + \left(\frac{46}{414}\right)^2 = \boldsymbol{1{,}607} \quad (25)$$

As it can be seen, the age variable has two levels, relative to the 25-year mark. For such situations, is also used the normalization of the expression of information energy:

$$\boldsymbol{E_{normalized}\,(\Xi\Xi = \frac{Ecalc. - E_{min}}{E_{max} - E_{min}}, \quad E_{min} = \frac{1}{2}(\frac{1}{n}\ or\ \frac{1}{m})} \quad (26)$$

After normalization, we obtain:

$$\boldsymbol{E_{normalized}\,(Y/X_1)} = \frac{E(Y/X_1) - \frac{1}{2}}{1 - \frac{1}{2}} = \left[2 \cdot E(Y/X_1) - 1\right]/(2-1) = 2 \cdot [\left(\frac{365}{733}\right)^2 + \left(\frac{368}{733}\right)^2] - 1 = \boldsymbol{0}$$

$$\boldsymbol{E_{normalized}\,(Y/X_2)} = \frac{E(Y/X_2) - \frac{1}{2}}{1 - \frac{1}{2}} = \left[2 \cdot E(Y/X_2) - 1\right]/(2-1) = 2 \cdot [\left(\frac{45}{91}\right)^2 + \left(\frac{46}{91}\right)^2] - 1 = \boldsymbol{0}$$

$$\boldsymbol{E_{normalized}\,(X/Y_1)} = \frac{E(X/Y_1) - \frac{1}{2}}{1 - \frac{1}{2}} = \left[2 \cdot E(X/Y_1) - 1\right]/(2-1) = 2 \cdot [\left(\frac{365}{410}\right)^2 + \left(\frac{45}{410}\right)^2] - 1 = \boldsymbol{0{,}609} \quad (27)$$

$$\boldsymbol{E_{normalized}\,(X/Y_2)} = \frac{E(X/Y_2) - \frac{1}{2}}{1 - \frac{1}{2}} = \left[2 \cdot E(X/Y_2) - 1\right]/(2-1) = 2 \cdot [\left(\frac{368}{414}\right)^2 + \left(\frac{46}{414}\right)^2] - 1 = \boldsymbol{0{,}605}$$

Comparing the results, we observe that the informational energy of ***X***, over the ***Y_1*** and ***Y_2*** attributes is **0,6** and that of the variable ***Y*** over the attributes ***X_1*** and ***X_2*** is null, so the attributes ***Y_j*** transmit some quantity of information in the presence of variable ***X***. In other words, the anime products influence the target population, mainly the segment under 25 years.

The ***Y*** variable has two alternatives or attributes: these variants are positioned vertically, on columns, in the base matrix. Regarding the weight of the importance of the attributes as a measure of the importance in a decisional situation, this is given by the normalized version:

a) $E_{normalized}(Y/X_i)$(respectivly $E_{normalized}(X/Y_j)$) or :

b) With help of the especific weights, W_i, W_j, considered as a measure of the complex personality of the decision maker.($W_j=Y_j/824$, the *"extrinsic importance / specific weight").*

Alternatively, for $E_{normalized}(Y/X_i)$, can be ponderated with $T_{i.}$, respectively the total number of young people under the age of 25, respectively over this age, and for $E_{normalized}(X/Y_j)$, cu $T_{.j}$, which is all subjective evaluation of attributes weights.

From the calculations, it turned out that the importance of the ***Y_1*** attribute is greater than that of its ***Y_2*.**

Next, we will calculate the importance of attributes using another way, namely the size called "*information entropy*" (where: ***K1**, **K2*** are positive constants equal to ***1/ln2***). We calculate the entropy of each variable under the influence of each other's alternatives, so we will find that if the result is large, the transmitted energy remains small, and the variable is not significant for the decision, and for each other.

a) The importance of decision due to the attributes ***X_1, X_2*** :

$$\mathbf{H(Y/X_{i=1})} = -K_1 \cdot \sum_{j=1}^{m=2} \left(\frac{x_{1j}}{T_{1.}}\right) ln\left(\frac{x_{1j}}{T_{1.}}\right) = (-1/ln2) \cdot \left(\frac{365}{733} ln\left(\frac{365}{733}\right) + \left(\frac{368}{733} ln\left(\frac{368}{733}\right)\right) = \mathbf{0,(9)}$$

$$\mathbf{H(Y/X_{i=2})} = -K_1 \cdot \sum_{j=1}^{m=2} \left(\frac{x_{2j}}{T_{2.}}\right) ln\left(\frac{x_{2j}}{T_{2.}}\right) = (-1/ln2) \cdot \left(\frac{45}{91} ln\left(\frac{45}{91}\right) + \left(\frac{46}{91} ln\left(\frac{46}{91}\right)\right) = \mathbf{0,99991} \quad (28)$$

In the case of the first attributes, ***X1, X2*,** the entropy is significant and we will see that, in parallel, the information energy is diminished. By contrast, when the attributes ***Y1, Y2*** have a lower entropy, they are consequently important to the decision-maker, transmitting a greater amount of information.

b) the importance of attributes ***Y1, Y2*** (the anime products) for decision:

$$\boldsymbol{H(X/Y_{j=1})} = -K_2 \cdot \sum_{i=1}^{n=2} \left(\frac{x_{i1}}{T_{.1}}\right) ln\left(\frac{x_{i1}}{T_{.1}}\right) =$$
$$= -(1/ln2)\cdot\left(\frac{365}{410} ln\left(\frac{365}{410}\right) + \left(\frac{45}{410} ln\left(\frac{45}{410}\right)\right) \cong \boldsymbol{0{,}5}\right.$$
$$\boldsymbol{H(X/Y_{j=2})} = -K_2 \cdot \sum_{i=1}^{n=2} \left(\frac{x_{i2}}{T_{.2}}\right) ln\left(\frac{x_{i2}}{T_{.2}}\right) = \qquad (29)$$
$$= (-1/ln2)\cdot\left(\frac{368}{414} ln\left(\frac{368}{414}\right) + \left(\frac{46}{414} ln\left(\frac{46}{414}\right)\right) = \boldsymbol{0{,}50326} \cong \boldsymbol{0{,}5}\right.$$

Representing the whole system as a cybernetic system with inputs and outputs, we obtain:

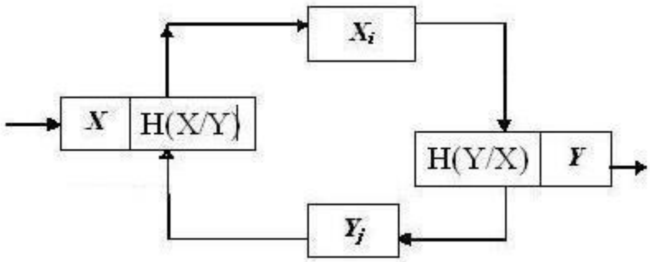

Figure 1 The cyber-system of Entropy

The entropy (disorganization) of the output of the overall system, denoted by ***Y***, is given by an alternative $\boldsymbol{X_i}$, or both ($\boldsymbol{H}(\boldsymbol{Y}/\boldsymbol{X_i})$); analog, the rectified entropy of the ***X*** input, is due to a decision alternative or a $\boldsymbol{Y_j}$ reaction, or both ($\boldsymbol{H}(\boldsymbol{X}/\boldsymbol{Y_j})$)**.** Because the negative amount is maximum when the terms are the equal, respectively $\boldsymbol{X_{ij}/T_{i.}=1/2}$(generaly ***1/m***), we obtain: $\boldsymbol{H_{max(m)}=-\ ln(1/m)=ln2}$. As a result, we proceeded to make the allocation: $\boldsymbol{K_1= K2=1/H_{max(2)}=1/ln2}$.(in our example: ***m=n=2***) It results: $0\leq \boldsymbol{H(X_i)},\ \boldsymbol{H(Y_j)}\leq 1$.

To calculate the intrinsic importance (normalized information energy), we will use the formula:

$$R_i = E_{normalized}(Y/X_i) = \left[m \cdot E(Y/X_i) - 1\right]/(m-1), \qquad i = \overline{1,n}$$
$$\Rightarrow \quad \boldsymbol{R_{i=1}} = E_{normalized}(Y/X_1) = \left[m \cdot E(Y/X_1) - 1\right]/(m-1) \cong \boldsymbol{0}$$
$$\boldsymbol{R_{i=2}} = E_{normalized}(Y/X_2) = \left[m \cdot E(Y/X_2) - 1\right]/(m-1) \cong \boldsymbol{0} \qquad (30)$$

Similarly:

$$R_j = E_{normalized}(X/Y_j) = \left[n \cdot E(X/Y_j) - 1\right]/(n-1), \qquad j = \overline{1,m} \qquad (30')$$
$$\Rightarrow \quad \boldsymbol{R_{j=1}} = E_{normalized}(X/Y_1) = \left[n \cdot E(X/Y_1) - 1\right]/(n-1) = \boldsymbol{0{,}218}$$
$$\boldsymbol{R_{j=2}} = E_{normalized}(X/Y_2) = \left[n \cdot E(X/Y_2) - 1\right]/(n-1) = \boldsymbol{0{,}210}$$

The higher is the entropy, the smaller is the intrinsic importance **Ri.**

Consequently, the "*relative entropy"* magnitude of an attribute, and the *"amount of information"* transmitted, respectively, are ***inversely proportional***. So if the entropy caused by an attribute is the maximum, that attribute will not transmit any information. The higher the entropy associated with an attribute is, the smaller is the amount of information transmitted by that attribute (hence its intrinsic importance), and vice versa: the less is the entropy, the greater is the amount of information (the importance of the attribute).

The conclusion that has been demonstrated so far is that the ***Y*** variable is significant for the decision.

However, if we transpose the data matrix, we notice a notable difference between columns / attributes of the age variable, framed in columns. As a result, we can conclude that age is a determining factor for the purchase of anime products and, in general, for the attachment to this form of culture. Returning to the form of the matrix initially presented, with ***Y*** = the anime products, on columns, we can also calculate a few significant amounts.

Such an entity is the *"global importance of an attribute"(*for example), which is calculated by the formula:

$$I_i = R_i \cdot W_i, i = \overline{1,n}$$
$$I_j = R_j \cdot W_j, j = \overline{1,m} \tag{31}$$

For the attribute $\boldsymbol{Y_j}$, belonging to the variable ***Y*** (anime products), we will then calculate:

$$\begin{aligned} I_j &= R_j \cdot W_j, j = \overline{1,m} \\ \boldsymbol{I_{j=1}} &= R_1 \cdot W_1 = 0{,}21 \cdot 0{,}4975 = \boldsymbol{0{,}1044} \\ \boldsymbol{I_{j=2}} &= R_2 \cdot W_2 = 0{,}21 \cdot 0{,}5024 = \boldsymbol{0{,}1055} \end{aligned} \tag{32}$$

These attributes of anime derivatives can be used to complete the decision. For the attributes $\boldsymbol{X_i}$, belonging to the variable ***X*** (age), we calculate as well:

$$\begin{aligned} \boldsymbol{I_i} &= R_i \cdot W_i, i = \overline{1,n} \\ \boldsymbol{I_{i=1}} &= R_1 \cdot W_1 = 0 \cdot 0{,}8895 = 0 \\ \boldsymbol{I_{i=2}} &= R_2 \cdot W_2 = 0 \cdot 0{,}1104 = 0 \end{aligned} \tag{32'}$$

The other dimension we are interested of, is the "*information input (transinformation)"* brought by a variable to another one, and ultimately, to the decision. It is expressed with the help of the information energy, as follows:

$$\begin{aligned}
&\boldsymbol{AI(X,Y)} = \overline{E(X/Y)} - E(X) = \\
&= \sum_{j=1}^{2} p(Y_j)\cdot E(X/Y_j) - \sum_{i=1}^{2} p^2(X_i) = \frac{410}{824}\cdot 0{,}8045 + \frac{414}{824}\cdot 0{,}8025 - \\
&- 0{,}8 = \boldsymbol{0{,}03}
\end{aligned} \tag{33}$$

$$\begin{aligned}
&\boldsymbol{AI(Y,X)} = \overline{E(Y/X)} - E(Y) = \\
&= \sum_{i=1}^{2} p(X_i)\cdot E(Y/X_i) - \sum_{i=1}^{2} p^2(Y_i) = \frac{733}{824}\cdot 0{,}500008 + \frac{91}{824}\cdot 0{,}50006 \\
&- 0{,}5 = \boldsymbol{0{,}00014 \cong 0}
\end{aligned}$$

where the first formula expresses the "*information input"* brought by the ***Y*** (anime products) variable to the ***X*** (age) variable, and the second formula refers to the "*information input"* brought by ***X*** to ***Y***.

In parallel, using the entropy of the variables, we will make the following remarks:

$$\begin{aligned}
&H(Y,X) = H(Y/X) + H(X) \Rightarrow H(Y/X) = H(Y,X) - H(X), \\
&H(X,Y) = H(X/Y) + H(Y) \Rightarrow H(X/Y) = H(X,Y) - H(Y) \\
&\boldsymbol{H(Y,X)} = H(Y/X) + H(X) = H(Y/X_1) + H(Y/X_2) + H(X) = 0{,}99999 + 0{,}99991 + 0{,}5012 \cong \boldsymbol{2{,}5} \\
&\boldsymbol{H(X,Y)} = H(X/Y) + H(Y) = H(X/Y_1) + H(X/Y_2) + H(Y) == 0{,}5 + 0{,}5 + 1 \cong \boldsymbol{2}
\end{aligned}$$

$$\begin{aligned}
&\boldsymbol{I(X,Y)} = H(X) - H(X/Y) = H(X) + H(Y) - H(Y,X) = \cong \boldsymbol{0{,}5} + \boldsymbol{1} - \boldsymbol{2{,}5} = \boldsymbol{-1} \\
&\boldsymbol{I(Y,X)} = H(Y) - H(Y/X) = H(Y) + H(X) - H(Y,X) == 1{,}5 - 2 = \boldsymbol{-0{,}5} \\
&\Rightarrow \boldsymbol{I(Y,X) > I(X,Y)}, \quad \begin{array}{l} \boldsymbol{I(Y,X) - I(X,Y) \cong 0{,}5} \\ \boldsymbol{HY,X) - H(X,Y) \cong 0{,}5} \end{array}
\end{aligned} \tag{34}$$

The *"informational input / transinformation"* of the ***Y*** variable, evaluated in the presence of ***X***, is greater than the *"information input" of* ***X*** in the presence of ***Y***, which is virtually null, so the age can not be influenced by anime products, it is a physical quality, but it can be a factor of influence for the buyer "*preference"* , both for the language and the acquire of the derivative products.

5. Extending considerations for the 3rd factor

Table 3

Experiment with 3 factors

a) Influence of Z and X variables upon Y variable

C=AGE	A=ACTIVITY	B= ANIME PRODUCTS		total
		subtitled	derivative	
<25 years	buyers	89	140	229
	visitors	94	43	137
Total less than 25 years		183	183	366
>25 years	buyers	11	17	28
	visitors	12	5	17
Total greater than 25 years		23	22	45
TOTAL		206	205	411

b) Influence of Z variable upon X , Y variables

C =AGE	<25 years	>25 years	TOTAL
A= ACTIVITY	subtitled	derivative	
	89	11	100
	140	17	157
buyers	229	28	257
	94	12	106
	43	5	48
visitors	137	17	154
TOTAL	366	45	411

Resuming the previous example, we will also consider the factor "*activity*", marked with ***A***. Since the factor is not numeric, the probability matrix will not be changed significantly in our case.

The total population existing in the three dimensions,***n,m,p***, is noted ***T...***, as a result: $T_{i.k}$ will represent the total of the line ***i***, from the matrix ***k***, $T_{.jk}$ will be the total of the column ***j*** , $T_{..k}$ will be the general sum of the matrix ***k***.

To calculate the energies conditioned by the alternatives ***i, j, k*** of the variables ***X, Y, Z,*** we will use the formulas:(Table 3b)

$$\begin{aligned} AI(Y,Z) &= \overline{E(Y/Z)} - E(Y) = 0{,}53 - 0{,}50 = 0{,}03 \\ AI(X,Z) &= \overline{E(X/Z)} - E(X) = 0{,}8055 - 0{,}8 = 0{,}056 \cong 0{,}06 \end{aligned} \qquad (35)$$

and for determine the "*information input*" ***AI*** ("*transinformation*" ***I***) brought by the variable ***Z***, to the variable ***Y*** and ***X***:

$$\boldsymbol{p(y_j)/(z_k) = p(y_{jk})/p(z_k)}; \quad \boldsymbol{p(x_i)/(z_k) = p(x_{ik})/p(z_k)} \tag{36}$$

where:

$$\begin{aligned}
&\overline{\boldsymbol{E(Y,Z)}} = \sum_{k=1}^{p} E(Y/Z_k)\frac{T_{..k}}{T_{...}} = \sum_{k=1}^{p} E(Y/Z_k)\cdot p(X_k) = = \sum_{k=1}^{p}\left(\sum_{j=1}^{m} p^2(Y_j/Z_k)\right)\cdot p(X_k) = \\
&\sum_{k=1}^{2}\left(\sum_{j=1}^{2} p^2(Y_j/Z_k)\right)\cdot p(X_k) = \sum_{k=1}^{2}\left(p^2(Y_1/Z_k) + p^2(Y_2/Z_k)\right)\cdot p(X_k) = \\
&(p^2(Y_1/Z_1) + p^2(Y_2/Z_1))\cdot p(X_1) + (p^2(Y_1/Z_2) + p^2(Y_2/Z_2))\cdot p(X_2) = \\
&[(p(y_{11})/p(z_1))^2 + (p(y_{21})/p(z_1))^2]\cdot\frac{T_{..1}}{T_{...}} + [(p(y_{12})/p(z_2))^2 + (p(y_{22})/p(z_2))^2]\cdot\frac{T_{..2}}{T_{...}} = \\
&[(229/366)^2 + (137/366)^2]\cdot\frac{257}{411} + [(28/45)^2 + (17/45)^2]\cdot\frac{154}{411} = 0{,}332 + 0{,}1985 = \boldsymbol{0{,}53}
\end{aligned} \tag{37}$$

Which means that the variable ***Y*** has an apparent average energy in the presence of the ***Z*** variable, so buying products or visiting such events has an influence on the variation in trade of the subtitled or derived anime products, which was to be expected. The first component of the result, which refers to the purchase of such products by the segment below 25 years of age, is more bigger than the second.

$$\begin{aligned}
&\overline{\boldsymbol{E(X,Z)}} = \sum_{k=1}^{p} E(X/Z_k)\frac{T_{..k}}{T_{...}} = \sum_{k=1}^{p} E(X/Z_k)\cdot p(Y_k) = \\
&= \sum_{k=1}^{p}\left(\sum_{i=1}^{m} p^2(X_i/Z_k)\right)\cdot p(Y_k) = \sum_{k=1}^{2}\left(\sum_{i=1}^{2} p^2(X_i/Z_k)\right)\cdot p(Y_k) = \\
&\sum_{k=1}^{2}\left(p^2(X_1/Z_k) + p^2(X_2/Z_k)\right)\cdot p(Y_k) = \\
&(p^2(X_1/Z_1) + p^2(X_2/Z_1))\cdot p(Y_1) + (p^2(X_1/Z_2) + p^2(X_2/Z_2))\cdot p(Y_2) = \\
&[(p(x_{11})/p(z_1))^2 + (p(x_{21})/p(z_1))^2]\cdot\frac{T_{.1.}}{T_{...}} + [(p(x_{12})/p(z_2))^2 + (p(x_{22})/p(z_2))^2]\cdot\frac{T_{.2.}}{T_{...}} = \\
&[(229/257)^2 + (28/257)^2]\cdot\frac{366}{411} + [(137/154)^2 + (17/154)^2]\cdot\frac{45}{411} = 0{,}7176 + 0{,}088 = \boldsymbol{0{,}8056}
\end{aligned} \tag{38}$$

The contribution of the age segment under 25 is overwhelming, as can be seen from the calculation of the information energy of ***X*** in the presence of the activity **A** (variable **Z**) The input due to the presence of the variables ***X*** in combination with ***Z*** is calculated by the difference of two energies, and is significantly higher:(Table 3a)

$$\boldsymbol{AI(Y/X \otimes Z)} = \overline{E(Y/X,Z)} - E(Y) = 1{,}415 - 0{,}8 = \boldsymbol{0{,}615} \qquad (39)$$

For the calculation of the ***Y*** variable energy, conditioned by the presence of **X** and **Z** variables, it have been used the evaluation:

$$\overline{\boldsymbol{E(Y/X,Z)}} = \sum_{\boldsymbol{i=1}}^{\boldsymbol{n}} \sum_{\boldsymbol{k=1}}^{\boldsymbol{p}} \boldsymbol{E(Y/X_i, Z_k)} \cdot \frac{\boldsymbol{T_{i.k}}}{\boldsymbol{T_{...}}} =$$
$$[(183/206)^2 + (183/205)^2] \cdot \frac{366}{411} + [(23/206)^2 + (22/205)^2] \cdot \frac{45}{411} = \boldsymbol{1{,}415} \qquad (40)$$

6. Conclusions

The purpose of this study was to apply a new theory, the information theory, to the results of a survey which the author has done, in order to prove, once again, some of the conclusions that have been already estimated: the importance of the young segment, the need for developing this new market, the existence of the anime e-marketing. The instruments we used are mainly related to “*the entropy*” of the system variables and their “*informational energy*“. It will be also other investigations related to the subject of the anime culture, its fans, but mostly, the new market of these derivative products, of which the investigations data we shall also translate in the informational language, searching the connections between factors, and most of it, the importance of them for the buyer decision.

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