ALRIGHT? - COMMON UNDERSTANDING ON THE ALREADY APPLIED INDUSTRY 4.0 SOLUTIONS, BETWEEN THE HUNGARIAN BEER INDUSTRY SUPPLIERS AND MULTINATIONAL BEER MAKERS

ILONA PAPP[1] & ISTVAN PESTI-FARKAS[2]

[1] University of Gyor, Gyula Kautz Faculty of Business Economics, Gyor, Hungary.
E-mail: pappi@sze.hu
[2] Vodafone, Sopron, Hungary.
E-mail: scientific.pesti@gmail.com

Abstract Our paper is aimed to analyze the current situation on the Hungarian beer industry, from the aspect of industry 4.0 understanding within the supply chain, namely between the manufacturers and their suppliers. After a literature review, we had examined the big data, the robotics and the overall digitalization related attitudes and understandings. The key finding is that the multinational companies have to deal with a previously unrecognized problem, namely the prejudices of local suppliers in regards the innovation of industry 4.0 tools.

1   The aim of the research, its hypotheses and research questions

I would like to measure the future technical developments related plans and attitudes of the participants within the supply chain, the aims shall be summarized in the following table:

Table 1: Dependencies between the hypotheses and research questions and problems

Number	H2
Research Problem	The attitude of the suppliers regarding to Industry 4.0 solutions had not been researched yet, therefore it shall be defined as basic level for further improvements.
Research Question	Does the beer manufacturers and their suppliers share a common understanding on the application of the Industry 4.0 solutions?
Hypothesis	The suppliers in the beer manufacturing industry – in opposite of the dominant members of the supply chain – do not share the common understanding on the already applied Industry 4.0 solutions.

Source: own creation

The hypothesis describes the connection of the examined parties of the supply chain (the multinational manufacturers and their direct Hungarian partners), based on the above mentioned industrial knowledge, with the focal point of Industry 4.0.

Understanding the results from the previous points about the industry, the cooperation with the dominant part in the chain and the Industry 4.0 solutions, an other hypothesis would like to determinate the attitude towards the sustainable and future oriented solutions.

The origins of the hypothesizes are the research questions, which are based on the research problems. The problems had been selected after the review of the international literature, the interviews and the author's professional experience.

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2   Research method

The research had been aimed to examine the research topic, therefore there had been different research methods had been selected from the Hungarian (Lengyelné and Tóvári, 2001; Majoros, 2006; Boncz, 2015) and international (Babbie, 1995; Huberman and Miles,1995; Mason, 2005; Ghauri és Grønhaug, 2011) literature review, after their careful consideration.

Based on production outputs and consumption data, the analyzed trends made possible to compare the data with the KSH and EUROSTAT data. The visualization had been performed with trendlines, as the values are continuous. In relation to the interviews, there had been context analysis performed in order to make notes on the hidden content, beside of the expresses one.

The performance of the Hungarian companies was sourced from the official annual reports of their, the EBIDTA value had been calculated based on these documents as well, the visualization of the data had been made on column chart. For the analysis of the industry, there had been several industry-analysis models mentioned, but We had applied the Porter one, in order to ensure the international comparison with other research results, beside of its popular nature.

The statistical population had been reached out with online questionnaire in order to collect proper answers in their quantity and quality. The questionnaire had been tested on buyer colleagues, the final one had been created with the consideration of their inputs. The answers for the describing statistics had been visualized with pie charts.

For the examination of the general attitude affinity and for the technological affinity, We had selected the factor analysis from the multivariate statistical analyses. The aim of the application was to reduce the variants and to identify them, beside of understanding the data with the available smallest data loss. As a first step, We had made the covariance matrix of the standardized variants and defined their correlation. Then I made factor extraction, which means the identification of the above. The value of the factors had been decided based on SPSS analysis, the values had been set in decreasing line, only the more-than-one values had been considered.

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(The criteria of 1 had been defined by the statistical method itself: the own value of the factor shows its contribution to the total value of variance, so, the less the value of the factor, the less it contributes to the total. The naming of the above reflect to the results: the factors had been identified as data analysis, robotics, logistics, office use and customer service. The table can be divided into three parts:

Initial Eigenvalues, Extraction Sums of Squared Loadings, Rotation Sums of Squared Loadings.

Based on the above mentioned factor analysis – as it was a recommendation of an opponent – we had performed cluster analysis as well, so having predefined nature, We had grouped the examined population, creating new clusters. The common describing fact of the new clusters, obviously, that they show similarities between the members. The new clusters are the following: 3rd Party Logistics Servicer (furthermore: 3PLS) transportation, 3PLS inventory, advisory, administration and high-tech.

The equalization of the standard deviations was performed using the "F" test, I chose the eta square as the effect size indicator, the value of the explained variance is above average in the areas of data analysis and public relations, it is around average in the case of robotics and lower in office and logistics. (The exact values are given in the relevant table).

Analysis of variance of values (i.e., ANOVA analysis) compares different mean values of the population, with the help of which I examined whether the variation of the total standard deviation of the base set can be explained by additional factors. Since it can also be used for the variables with the lowest measurement level, I decided to use a cross-tabulation for the hypotheses, which is a data table suitable for characterizing the relationship between the variables. In the matrix it created, the combined distribution of the values of two nominal or ordinal variables is usually visualized, thus showing cross-combinations of the values belonging to the variables.

Evidently, the table consists of cells that contain the values obtained for each combination of the values of the two variables (column and row variables). The values in these cells provide information about the relationship between the two variables. However, the percentage and numerical values in the cross-tabulation are not sufficient to characterize the relationship between the two variables, I used the chi-square test to test the relationship. The null hypothesis (H0) is basically that there is no correlation between the studied variables. Since the significance level for the chi-square value is lower than 0.05, I rejected the null hypothesis.

3   Results of the research

The focus of our research was on the application of industry 4.0 solutions in the supply chain of Hungarian, and more narrowly of Hungarian multinational brewers. I built our hypotheses around industry characteristics, integrity, robotics, and openness to professional advice, and after a statistical analysis of the responses to our questionnaire research, I can say that I have also verified it.

In the light of the collected data, it can be said that multinational manufacturers are mostly in business relations with Hungarian partners, and the proportion of Hungarian SMEs in their supply chain is significant. Most of the answers were given by the representatives of the companies operating in the supply chain, so I managed to get a unique view of our research, which is simultaneously related to a very important area of our economy, the development of small and medium enterprises and logistics service partners.

I find the results both frustrating and inspiring. They are frustrating, because a very large part of Hungarian SMEs have not even heard of these solutions, not even to implement them as their own development. The results are encouraging because businesses that have survived post-transition forced labor and the financial crisis of 2010-2012 have already been shown to be able to survive and adapt, so their approach to new technological developments can successfully help them overcome on the challenges that lie ahead of them.

The results of our research are in line with the results of the relevant literature, and the best of them are perhaps the closest to the one examining the e-banking habits of small and medium-sized enterprises (Fodor, Dunay, Illés 2011). It was also confirmed in 2019, ie 8 years after the aforementioned study, that Hungarian small and medium-sized enterprises, which are supplier partners of multinational brewers, are still struggling with digital solutions, they are not fully aware to them.

4   Verification of the hypothesis

The three sub-points of the hypothesis (namely big data management, robotics and digitization) were all analyzed with a cross-tabulation and the data obtained from them support the preliminary assumptions of the research: at the next element of the supply chain, customers (whether a wholesaler or a retailer, possibly a HoReCa unit) have a positive picture of industry 4.0 trends, their own experience and answers to questions show that they consider the tripartite discussed above to be real, current processes. as part of their daily lives. I consider this experience to be a lack of knowledge and a lack of basic knowledge on the subject, because even a comparison with competitors can show that even though parts of the daily routine have an online presence or electronic devices, they are not entirely new to industry 4.0. solutions.

Figure 1: Application of Big Data
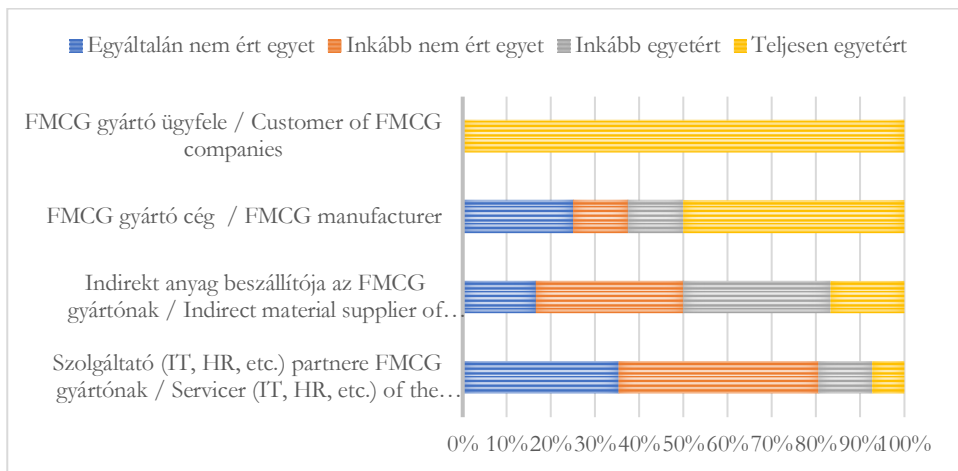
In terms of the number of responses, service providers are over-represented in the cross-tabulations, but it is interesting that, in contrast to the group mentioned above, they explicitly disagree (or in a less pronounced form, "rather not") with the triple trend. Their responses carry information that, due to their size and cross-industry network of contacts and transactions, these firms are more likely to encounter industries that are much more technology-intensive (see, e.g., automotive) and have formed their opinions relative to them.

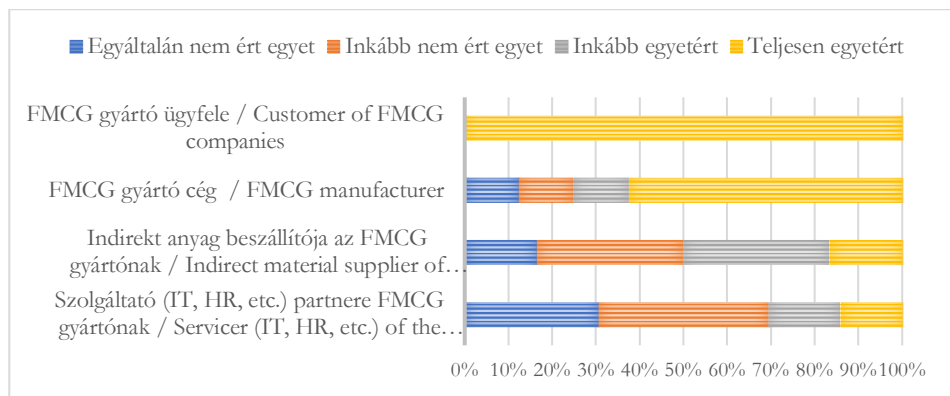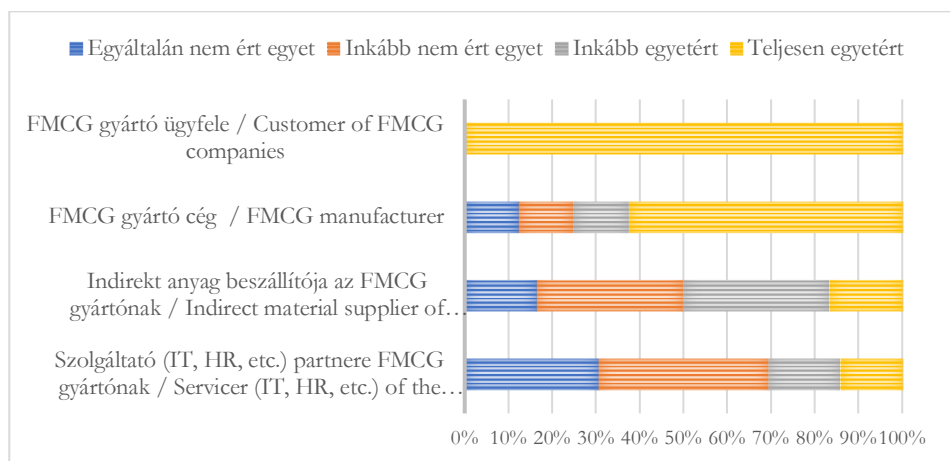**Figure 2: Application of robotics**

Figure 3: Digitalization of business and manufacturing processes

Their views on the beer industry are in line with the trends in the literature (in fact, in a broader context, the CEE region), ie they confirm the fact that Hungarian, Romanian, Slovak, etc. In the economy, only those enterprises in their industry use industry 4.0 assets that the strongest, most dominant player in their supply chain (practically, including the automotive industry already mentioned above) expects and can assert the cost of the investment in their pricing as a supplier. Thus, the hypothesis that industry suppliers, as opposed to the dominant member of the supply chain, do not see Industry 4.0 solutions as being used in the industry has been confirmed and accepted for this purpose.

5   Conclusion

Based on the hypothesis ("In the Hungarian beer industry, the non-dominant members of the supply chain, suppliers currently have different, negative opinions on the current application of Industry 4.0 solutions"), our research points out that the Hungarian attitude towards Industry 4.0 solutions contradicts multinational represented by companies, ie the application of solutions that may already be used abroad in Hungary may encounter obstacles, in addition to technical difficulties, companies also have to deal with a previously unrecognized problem, namely the prejudices of local suppliers.

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