

SUMMARY OF RESEARCH FINDINGS

The projects aims to determine training needs of the students as potential employees and the employees. As we are in a transformation phase in digitization of manufacturing processes, the study takes training needs of the new industrial revolution also known as industry 4.0. First industrial revolution is the use of steam power, second industrial revolution of electric motors, and the third is the programmable logic controllers or CNCs in manufacturing. The fourth industrial revolution adheres to the connecting computers and allowing machines communicate with each other to make decisions without human involvement, also known as internet of things, allowing smart factories. The new paradigm shift in manufacturing processes requires new skills, as current education system is designed for previous production, the study proposes that employees and students may need training to adopt themselves for new production pattern.

Conclusion for Students and Employees

The study took place in Spain, Poland, Hungary, Romania and Turkey. Data is collected from 90 students and 61 employees in Spain, 89 students and 73 employees in Romania, 100 students and 58 employees in Hungary, 138 students and 94 employees in Poland and 109 students and 60 employees in Turkey, with purposive sampling. Based on Prifti et. al. (2017) Industrie 4.0 Competency Model a questionnaire form is used as the data collection tool. Frequency analysis is conducted in order to determine the training need analysis of students and employees in each country. While table 1 shows the findings for students, table 2 shows the results for employees in 5 partner countries.

Table 1. Statistics for Students in 5 Countries

Descriptives for Students			
DIMENSION	COUNTRY	MEAN	STD. ERROR
1. Leading and Decision	SPAIN	3,5956	,09157
	ROMANIA	3,7333	,10697
	HUNGARY	3,7739	,08574
	POLAND	3,8019	,04904
	TURKEY	3,7262	,08300
	TOTAL	3,7425	,03481
1.1. Decision and Initial Action	SPAIN	3,7213	,08942
	ROMANIA	4,0385	,10302
	HUNGARY	3,8736	,08813
	POLAND	3,9094	,05045
	TURKEY	3,7381	,08231

	TOTAL	3,8621	,03503
1.2. Leading and Supervising	SPAIN	3,3443	,12344
	ROMANIA	3,1231	,15583
	HUNGARY	3,5747	,10293
	POLAND	3,5870	,07253
	TURKEY	3,7024	,09844
	TOTAL	3,5034	,04710
2. Supporting and Cooperation	SPAIN	3,9590	,10291
	ROMANIA	4,3641	,08072
	HUNGARY	3,9157	,07477
	POLAND	3,9251	,04068
	TURKEY	3,7599	,05725
	TOTAL	3,9617	,03054
2.1. Working with People	SPAIN	3,9781	,10623
	ROMANIA	4,4462	,09078
	HUNGARY	4,1533	,08457
	POLAND	3,9734	,04969
	TURKEY	3,7262	,07641
	TOTAL	4,0330	,03546
2.2. Adhering to Principles and Values	SPAIN	3,9399	,12357
	ROMANIA	4,2821	,08747
	HUNGARY	3,6782	,08879
	POLAND	3,8768	,05178
	TURKEY	3,7937	,06796
	TOTAL	3,8904	,03598
3. Interacting and Presenting	SPAIN	3,7022	,09237
	ROMANIA	3,3256	,12084
	HUNGARY	3,9521	,07442
	POLAND	3,5495	,04623
	TURKEY	3,6131	,06179
	TOTAL	3,6303	,03388
3.1. Relating and Networking	SPAIN	3,7486	,10502
	ROMANIA	3,0872	,13039
	HUNGARY	3,9425	,08429
	POLAND	3,4420	,05390
	TURKEY	3,6349	,06813
	TOTAL	3,5693	,03874
3.2. Persuading and Influencing	SPAIN	3,7295	,10749
	ROMANIA	3,3923	,14231
	HUNGARY	3,9368	,08488
	POLAND	3,6993	,05156
	TURKEY	3,5893	,09512
	TOTAL	3,6839	,04025
3.3. Presenting and Communicating Information	SPAIN	3,5082	,13352
	ROMANIA	3,9077	,12350
	HUNGARY	4,0115	,09028
	POLAND	3,5725	,06967
	TURKEY	3,5952	,09747
	TOTAL	3,7057	,04393
4. Analyzing and Interpreting	SPAIN	2,9384	,09455
	ROMANIA	2,6488	,12537
	HUNGARY	2,9473	,07520
	POLAND	2,9425	,04936
	TURKEY	3,1248	,05917
	TOTAL	2,9342	,03408
4.1. Writing and Reporting	SPAIN	3,4262	,11967
	ROMANIA	3,5846	,11735
	HUNGARY	4,0057	,08554

	POLAND	3,8877	,04657
	TURKEY	3,4345	,07323
	TOTAL	3,7138	,03762
4.2. Applying Expertise and Technology	SPAIN	2,8282	,09876
	ROMANIA	2,4642	,13631
	HUNGARY	2,7281	,08392
	POLAND	2,7895	,05282
	TURKEY	3,0383	,06478
	TOTAL	2,7821	,03712
4.3. Analyzing	SPAIN	3,3279	,11637
	ROMANIA	3,2423	,12488
	HUNGARY	3,6782	,08465
	POLAND	3,3496	,05883
	TURKEY	3,4673	,07343
	TOTAL	3,4190	,03853
5. Creating and Conceptualization	SPAIN	3,4772	,10487
	ROMANIA	3,2650	,12590
	HUNGARY	3,6564	,07749
	POLAND	3,4936	,05215
	TURKEY	3,5979	,06714
	TOTAL	3,5098	,03569
5.1. Learning and Researching	SPAIN	3,5738	,11016
	ROMANIA	3,9769	,11728
	HUNGARY	3,6839	,10016
	POLAND	3,8333	,05475
	TURKEY	3,7262	,08694
	TOTAL	3,7678	,03936
5.2. Creating and Innovation	SPAIN	3,6066	,11912
	ROMANIA	3,2654	,14707
	HUNGARY	3,9454	,08321
	POLAND	3,6214	,05407
	TURKEY	3,5833	,07447
	TOTAL	3,6236	,04021
5.3. Formulating Strategies	SPAIN	3,2404	,11482
	ROMANIA	2,7897	,13147
	HUNGARY	3,2529	,08634
	POLAND	3,0966	,06507
	TURKEY	3,5317	,08508
	TOTAL	3,1862	,04170
6. Organizing and Executing	SPAIN	3,4160	,10506
	ROMANIA	3,2673	,11804
	HUNGARY	3,5302	,08644
	POLAND	3,5507	,05569
	TURKEY	3,5134	,07764
	TOTAL	3,4782	,03705
6.1. Planning and Organization	SPAIN	3,4262	,11214
	ROMANIA	2,7333	,14233
	HUNGARY	3,7280	,09968
	POLAND	3,5411	,06480
	TURKEY	3,5159	,09163
	TOTAL	3,4368	,04511
6.2. Delivering Results and Meeting Customer Expectations	SPAIN	3,4836	,12802
	ROMANIA	3,0846	,16208
	HUNGARY	3,6494	,11360
	POLAND	3,5507	,07131
	TURKEY	3,5119	,10542
	TOTAL	3,4839	,04898
6.3. Following Instructions and Procedures	SPAIN	3,3607	,12401

	ROMANIA	3,9231	,10884
	HUNGARY	3,2529	,09021
	POLAND	3,5604	,06123
	TURKEY	3,5119	,07750
	TOTAL	3,5157	,03971
7. Adapting and Coping	SPAIN	3,6361	,11693
	ROMANIA	3,5015	,12428
	HUNGARY	3,6345	,08209
	POLAND	3,6058	,05167
	TURKEY	3,5810	,06686
	TOTAL	3,5954	,03618
7.1. Adopting and Responding to Change	SPAIN	3,6475	,12319
	ROMANIA	3,5385	,11950
	HUNGARY	3,6523	,08930
	POLAND	3,5870	,05620
	TURKEY	3,6012	,06842
	TOTAL	3,6040	,03765
7.2. Persuading and Influencing	SPAIN	3,5902	,14291
	ROMANIA	3,3538	,16027
	HUNGARY	3,5632	,09631
	POLAND	3,6812	,06422
	TURKEY	3,5000	,09042
	TOTAL	3,5609	,04552
8. Enterprising and Performing	SPAIN	3,5301	,10975
	ROMANIA	2,7744	,14873
	HUNGARY	3,5977	,08585
	POLAND	3,4493	,05794
	TURKEY	3,7143	,08086
	TOTAL	3,4406	,04232
8.1. Achieving Personal Work Goals and Objectives	SPAIN	3,5902	,12884
	ROMANIA	3,2308	,16521
	HUNGARY	3,7701	,09349
	POLAND	3,8478	,07119
	TURKEY	3,9524	,09416
	TOTAL	3,7241	,04722
8.2. Entrepreneurial and Commercial Thinking	SPAIN	3,5000	,11630
	ROMANIA	2,5462	,16251
	HUNGARY	3,5115	,09944
	POLAND	3,2500	,06571
	TURKEY	3,5952	,08614
	TOTAL	3,2989	,04703

Table 2. Statistics for Employees in 5 Countries

Descriptives for Employees			
DIMENSION	COUNTRY	MEAN	STD. ERROR
1. Leading and Decision	SPAIN	3,6525	,06645
	ROMANIA	4,2667	,08672
	HUNGARY	3,4422	,12387
	POLAND	3,9468	,05777
	TURKEY	3,9063	,11323
	TOTAL	3,8735	,04133
1.1. Decision and Initial Action	SPAIN	3,7979	,08691

	ROMANIA	4,4583	,08917
	HUNGARY	3,5714	,13041
	POLAND	4,0585	,06800
	TURKEY	4,0469	,12370
	TOTAL	4,0142	,04549
1.2. Leading and Supervising	SPAIN	3,3617	,09338
	ROMANIA	3,8833	,09827
	HUNGARY	3,1837	,12934
	POLAND	3,7234	,08061
	TURKEY	3,6250	,13282
	TOTAL	3,5922	,04820
2. Supporting and Cooperation	SPAIN	4,1028	,07813
	ROMANIA	4,6250	,06259
	HUNGARY	3,6224	,11952
	POLAND	4,0745	,05189
	TURKEY	4,0365	,09892
	TOTAL	4,1135	,03920
2.1. Working with People	SPAIN	4,0922	,10021
	ROMANIA	4,7056	,06243
	HUNGARY	3,6871	,13164
	POLAND	4,1454	,06369
	TURKEY	4,0938	,10608
	TOTAL	4,1702	,04380
2.2. Adhering to Principles and Values	SPAIN	4,1135	,08619
	ROMANIA	4,5444	,08309
	HUNGARY	3,5578	,11999
	POLAND	4,0035	,05869
	TURKEY	3,9792	,12517
	TOTAL	4,0567	,04308
3. Interacting and Presenting	SPAIN	3,6738	,08632
	ROMANIA	3,8167	,09203
	HUNGARY	3,6088	,12854
	POLAND	3,6791	,05373
	TURKEY	3,8073	,11128
	TOTAL	3,7098	,03958
3.1. Relating and Networking	SPAIN	3,6809	,10287
	ROMANIA	3,5944	,09993
	HUNGARY	3,6054	,12511
	POLAND	3,5213	,06565
	TURKEY	3,9063	,11323
	TOTAL	3,6217	,04339
3.2. Persuading and Influencing	SPAIN	3,6596	,10872
	ROMANIA	3,9083	,11053
	HUNGARY	3,6939	,14567
	POLAND	3,7234	,06445
	TURKEY	3,7656	,13467
	TOTAL	3,7518	,04701
3.3. Presenting and Communicating Information	SPAIN	3,6809	,14300
	ROMANIA	4,3000	,11473
	HUNGARY	3,4490	,15720
	POLAND	4,0638	,07684
	TURKEY	3,5938	,16716
	TOTAL	3,8901	,05679
4. Analyzing and Interpreting	SPAIN	2,8995	,10446
	ROMANIA	2,9707	,10460
	HUNGARY	2,7319	,11071
	POLAND	2,8206	,06643
	TURKEY	3,0259	,12125

	TOTAL	2,8736	,04306
4.1. Writing and Reporting	SPAIN	3,6915	,09068
	ROMANIA	4,2417	,09395
	HUNGARY	3,3878	,15990
	POLAND	4,1223	,05593
	TURKEY	3,5938	,13552
	TOTAL	3,8883	,04822
4.2. Applying Expertise and Technology	SPAIN	2,7262	,11509
	ROMANIA	2,7261	,11312
	HUNGARY	2,5652	,11245
	POLAND	2,5842	,07176
	TURKEY	2,8818	,13025
	TOTAL	2,6685	,04612
4.3. Analyzing	SPAIN	3,5000	,11431
	ROMANIA	3,7417	,11476
	HUNGARY	3,3622	,13424
	POLAND	3,5293	,07993
	TURKEY	3,5703	,14031
	TOTAL	3,5452	,04983
5. Creating and Conceptualization	SPAIN	3,5887	,09273
	ROMANIA	3,8093	,09945
	HUNGARY	3,4308	,13112
	POLAND	3,6939	,06019
	TURKEY	3,6285	,12735
	TOTAL	3,6478	,04293
5.1. Learning and Researching	SPAIN	3,6383	,11552
	ROMANIA	4,3583	,09289
	HUNGARY	3,4694	,15251
	POLAND	4,2979	,06251
	TURKEY	3,8125	,13975
	TOTAL	4,0018	,05083
5.2. Creating and Innovation	SPAIN	3,7447	,10244
	ROMANIA	3,8375	,11443
	HUNGARY	3,6173	,14100
	POLAND	3,7739	,06517
	TURKEY	3,5391	,14641
	TOTAL	3,7287	,04724
5.3. Formulating Strategies	SPAIN	3,3475	,11994
	ROMANIA	3,4056	,11620
	HUNGARY	3,1565	,13081
	POLAND	3,1844	,08309
	TURKEY	3,6250	,13112
	TOTAL	3,3038	,05061
6. Organizing and Executing	SPAIN	3,5372	,09943
	ROMANIA	3,8188	,10212
	HUNGARY	3,3393	,12742
	POLAND	3,7340	,05438
	TURKEY	3,7422	,11799
	TOTAL	3,6516	,04265
6.1. Planning and Organization	SPAIN	3,6312	,12672
	ROMANIA	3,4778	,13028
	HUNGARY	3,3946	,13527
	POLAND	3,6738	,06554
	TURKEY	3,6354	,13417
	TOTAL	3,5721	,04981
6.2. Delivering Results and Meeting Customer Expectations	SPAIN	3,4149	,14691
	ROMANIA	3,8000	,14468
	HUNGARY	3,7041	,14647

	POLAND	3,8564	,07199
	TURKEY	3,6875	,13975
	TOTAL	3,7252	,05531
6.3. Following Instructions and Procedures	SPAIN	3,5248	,10074
	ROMANIA	4,1722	,09720
	HUNGARY	3,0408	,13973
	POLAND	3,7128	,07264
	TURKEY	3,8854	,13604
	TOTAL	3,6820	,05061
7. Adapting and Coping	SPAIN	3,6681	,08863
	ROMANIA	4,0400	,09301
	HUNGARY	3,3265	,13699
	POLAND	3,6830	,05923
	TURKEY	3,7563	,11526
	TOTAL	3,7028	,04344
7.1. Adopting and Responding to Change	SPAIN	3,6755	,09646
	ROMANIA	4,0042	,10197
	HUNGARY	3,3520	,14796
	POLAND	3,7314	,06486
	TURKEY	3,7422	,11419
	TOTAL	3,7154	,04628
7.2. Persuading and Influencing	SPAIN	3,6383	,15032
	ROMANIA	4,1833	,09653
	HUNGARY	3,2245	,15503
	POLAND	3,4894	,09415
	TURKEY	3,8125	,17061
	TOTAL	3,6525	,05880
8. Enterprising and Performing	SPAIN	3,4610	,10267
	ROMANIA	3,4611	,12096
	HUNGARY	3,4354	,13650
	POLAND	3,3936	,08066
	TURKEY	3,7604	,11422
	TOTAL	3,4681	,04917
8.1. Achieving Personal Work Goals and Objectives	SPAIN	3,8298	,12658
	ROMANIA	4,0500	,11256
	HUNGARY	3,6122	,15923
	POLAND	3,8936	,08485
	TURKEY	3,8750	,13282
	TOTAL	3,8652	,05327
8.2. Entrepreneurial and Commercial Thinking	SPAIN	3,2766	,12523
	ROMANIA	3,1667	,15204
	HUNGARY	3,3469	,13771
	POLAND	3,1436	,09282
	TURKEY	3,7031	,12869
	TOTAL	3,2695	,05734

Findings suggest that in each country studied, both the students and the employees lack “analyzing and interpreting skills” which involves mostly IT and machine learning skills. This dimension is found as the weakest dimension of all 8 dimensions. In each partner countries participants are not skilled for Applying Expertise and Technology dimension, the lowest reported skills are Robotics/Artificial intelligence, Predictive maintenance and Big data/Data

analysis and interpretation. Mostly participants are found to be weak in these areas: Legislation awareness, Creating business networks, Economics, Extract business value from social media, Service orientation/product service offerings, Business process management, Business change management, Network security, IT architectures, System development, Integrating heterogeneous Technologies, Sensors/embedded systems, Network technology/M2M communication, Robotics/Artificial intelligence, Predictive maintenance, Modelling and programming, Big data/Data analysis and interpretation, Cloud computing/architectures, In-memory DBs, Statistics, Data security, Business strategy. It can be concluded that both the students and the employees lack these skills regardless of the country.

When the dimensions are evaluated separately, it is seen that the first dimension, leading and decision dimension is rated by students as 3.74 and 3.87 by employees. There is no difference among countries in terms of students. However, there is a difference in employees; Romanian employees can be said that they are the strongest in leading and decision dimension by rated 4.26.

When supporting and cooperation dimension has been investigated, it is seen that this dimension is rated by students as 3.96 and 4.11 by employees. This dimension is the strongest dimension among 8 dimensions. The reason why employees feel themselves better in this dimension than students can be the experience of the employees. There is a difference among countries in supporting and cooperation dimension. Romanian students and employees declares that they are strong in this dimension.

When interacting and presenting dimension is studied, it can be seen that this dimension is rated by students as 3.63 and 3.70 by employees. There is not such difference between students and employees in general. While Hungarian students are the strongest who rated 3.95 for this dimension, Romanian employees are the strongest who rated 3.81 for this dimension.

When analyzing and interpreting dimension has been evaluated it is seen that this dimension is rated by students as 2.93 and 2.87 by employees. There is no difference between students and employees in terms of scores. However, employees have higher scores than students in other dimensions. In analyzing and interpreting dimension students are found to be slightly higher than employees. The reason for the fact that students has higher scores than the employees may result from their age. Because new generation is born with technology. When the countries are compared, Turkey is found to have highest scores in this dimension. Turkish students rate as 3.12 and Turkish employees rate as 3.02. This dimension has 3 sub-dimensions;

writing and reporting, applying expertise and technology and analyzing. The weakest sub-dimension is found to be applying expertise and technology both for students and employees.

When the fifth dimension, creating and conceptualization is evaluated it is seen that this dimension is rated by students as 3.50 and 3.64 by employees. It can be suggested that there is no difference between two groups. When the countries are compared, Hungary is the country found strongest in this dimension for students and Romania is the country found strongest in this dimension for employees. Hungarian students are found to be the highest scores as 3.65 and Romanian employees rated themselves as 3.80.

When the sixth dimension organizing and executing dimension is evaluated, it is seen that this dimension is rated by students as 3.47 and 3.65 by employees. When the countries are compared, Poland is the country found strongest in this dimension for students (Hungarian scores are slightly differ than Polish one) and Romania is the country found strongest in this dimension for employees. Polish students are found to be the highest scores as 3.55 and Romanian employees rated themselves as 3.81.

When the seventh dimension adapting and coping dimension is evaluated, it is seen that this dimension is rated by students as 3.59 and 3.70 by employees. When the countries are compared, Spain and Hungary are the countries found strongest in this dimension for students and Romania is the country found strongest in this dimension for employees.

When the last dimension enterprising and performing dimension is evaluated, it is seen that this dimension is rated by students as 3.44 and 3.46 by employees. When the countries are compared, Turkey is the country found strongest in this dimension both for students (3.71) and for employees (3.76).

To sum up the findings, it can be infer that while analyzing and interpreting dimension is found to be the weakest dimension both for students and employees, supporting and cooperation dimension is found to be the strongest dimension both for students and employees in five countries. Employees have more scores than students in all dimensions except analyzing and interpreting dimension which is related to technology. In general Romanian employees are better than other countries' employees except two dimensions; analyzing and interpreting dimension and enterprising and performing dimension. In these two dimensions both Turkish students and employees are found to have highest scores.

In the light of this research, it can be suggested that employees need additional training in these areas:

- Analyzing and interpreting
 - Applying expertise and technology
- Creating and Conceptualizing
 - Formulating strategies
- Enterprising and Performing
 - Entrepreneurial and commercial thinking

In the light of this research, it can be suggested that students need additional training in these areas:

- Analyzing and interpreting
 - Applying expertise and technology
 - Analyzing
- Creating and Conceptualizing
 - Formulating strategies
- Organizing and Executing
 - Planning and organization
 - Delivering results and meeting customer expectations
- Enterprising and Performing
 - Entrepreneurial and commercial thinking

The findings of the study suggests that employees and students are aware of the changing business dynamics. However, they have difficulties in adapting themselves to new business styles. They know making money dynamics is changing, but they do not know how to make money in this new era. Every person should not need to be a software expert, but should know how to do business with this new business styles. Thus, the authors suggest that, employees and students should be trained in the areas that sharpens their entrepreneurial skills.

Conclusion for Managers

As the project targets also the managers, the research focuses on the managers. As it is quite difficult to conduct a questionnaire to the managers, it is preferred to conduct in-deep interview. Due to the difficulty in getting the managers to fill in the questionnaire, the best solution is considered be to carry out an “In deep interview” in order to find out the views of managers on Industry 4.0. As there are big challenges that are being totally changing the labour conditions in our society, it is aimed to understand and find out whether the business market is ready for the changes in the near future and how the companies deal with the Industrial Revolution 4.0. Each five country have conducted semi-structured interview with the managers from the sectors of education, service and manufacture. Before starting the interviews with the managers, the aim of the project was told and asked whether the interviewee is already aware of Industry 4.0. If the interviewee does not know I4.0, then the concept of I4.0 is explained with examples.

- **Findings for new position in another sector:**

Turkish managers state that they can easily find a new position in another sector. The sectors varies from advertising, real estate industry, geology to education. . Polish managers and Spanish are in the opinion that it is rather easy. All the managers in Hungary answered that it would be easy, because Hungarian managers all are confident leaders and good professionals. As some of them said unfortunately there is lack of professionals in Hungary at the moment. But Romanian managers think that it is hard to find a new position in another sector.

- **Findings for preserving working as manager:**

All Turkish managers regardless of the sector stress that they can find a new position in the same position as a manager. Hungarian managers think that it is quite easy to find a new job as manager again. But Romanian and Polish managers think that it is hard and difficult to find a new position in the same position.

The Skill Kit in Order to Continue Working as a Manager:

For service sector: in order to keep the customer satisfaction to keep up to date himself/herself on the sector, in order to capture the requirements of the digital age knowledge on digital media

and internet, digitalization and IT, ICT, time management, having a good mentoring programme, life long learning and development of skills like leadership

For manufacturing sector: knowledge on human resources, good command of subject on law, digital integration, system design, environmental management, presentation skills, anger management, communication skills, digitalization and IT, work-life balance, ICT, having a good mentoring programme, life long learning and development of skills like leadership

For education sector: interpersonal communication, knowledge on technology, foreign language, digitalization and IT, having a good mentoring programme, life long learning and development of skills like leadership

- **The Effects of Industry 4.0 for Lower Positions:**

Turkish managers have different opinion about the effects of Industry 4.0 for lower positions. The managers in tourism sector believes that the Industry 4.0 will have little effect on tourism sector even for the lower positions because service sectors rely on human interaction. The managers in education sector believes that automation can be a threat for administrative staff and the academics who give lectures on common courses such as Turkish language, history because of online education. The managers in manufacturing sector believes that automation has already a threat for lower positions. Polish managers, despite the threat of automation, are not afraid that their or their employees are going to lose their jobs. Hungarian managers think that Industry 4.0 is already present and for sure will be in the future too. They said that there will be changes, but also new challenges, where human resoruces will be needed. They need to be re-trained. Spanish managers think that related to human resources, the arrival of industry 4.0 will lead to a job loss.

