Content

	List of Abbreviations	**vii**
	List of Tables	**xi**
	List of Figures	**xii**
	Acknowledgments	**xv**
	Introduction	**xvi**
1.	**Industry 4.0**	**20**
1.1.	Industry 4.0 historical review	20
1.1.1	First industrial revolution	21
1.1.2	Second industrial revolution	23
1.1.3	Third industrial revolution	27
1.1.4	Fourth industrial revolution	34
2.	**Circular Economy**	**49**
2.1.	Circular economy historical review	50
2.2.	European Union on Circular economy	57
2.2.1	Horizon 2020 and Horizon Europe pillars	61
2.2.2	European citizens towards the environment	64
3.	**Industry 4.0 Core Technologies**	**73**
3.1.	Autonomous robots	74
3.2.	Simulation	80
3.3.	Horizontal and vertical system integration	83
3.4.	The Industrial Internet of Things	87
3.5.	Cybersecurity	93
3.6.	Cloud Computing	99
3.7.	Additive Manufacturing	105
3.8.	Augmented reality	110
3.9.	Big data and analytics	115
3.10.	Artificial Intelligence: the glue of I4.0 technologies	122
3.11.	RAMI 4.0 framework	130
4.	**Process management for industry 4.0**	**133**
4.1.	Process Management 4.0	134
4.2.	Technology scouting	139
4.3.	Intelligent factory – intelligent production	141
4.4.	Internet of People	142
4.5.	Self-management	145
4.6.	Process stabilisation model	146
4.7.	Core attributes of process management 4.0	157
5.	**Human & Technology in Process Management 4.0**	**160**
5.1.	Digital literacy of human in process management 4.0	167
5.2.	Data Analytics in Process Management 4.0	176

5.3. Process Management 4.0 recommendations for future actions 188
5.4. Conclusion 193
6. WHEN CIRCULAR ECONOMY MEETS INDUSTRY 4.0 197
CONCLUSION 211
PUBLICATION BIBLIOGRAPHY 213
INDEX 235
UNIVERSITY TEXTBOOK AUTHORS BIO 239