



Scholarly Output

Figures concerning the scholarly output provide a picture of how scientific production evolved over time. Figure 1 plots the scholarly output of our researchers in Industry 4.0 related topics during the last 20 years. The Figure shows an evident increasing trend in publications, revealing the importance these topics have gained over time. In particular, the scholarly output has grown substantially since the 2003, reaching 267 publications in 2016. In Figure 2, instead, we disentangled the contribution of each research area. A large share of all the publications comes from Chemistry and Physics studies, followed by Computer Science. However, Figure 2 shows that the research areas share a common increasing trend, though at slightly different rates, highlighting the relevance of the role played by each field.

Figure 1: Numbers of Unito publications related to Industry 4.0 yearly from 1996 to 2016

Publication Year	Scholarly Output
1996	42
1997	52
1998	41
1999	57
2000	34
2001	57
2002	70
2003	60
2004	79
2005	85
2006	96
2007	116
2008	118
2009	143
2010	154
2011	157
2012	181
2013	214
2014	201
2015	253
2016	267



Figure 2: Number of UniTo publications related to Industry 4.0 yearly from 1996 to 2016

Publication Year	Scholarly Output				
	Agriculture	Chemistry	Computer Science	Physics	Social Sciences
1996	0	12	4	25	1
1997	1	17	8	25	1
1998	1	18	4	17	1
1999	1	14	3	37	2
2000	2	14	5	13	0
2001	1	28	3	22	3
2002	3	25	11	29	2
2003	3	17	6	33	1
2004	0	38	9	31	1
2005	4	22	8	46	5
2006	7	31	16	41	1
2007	10	44	15	40	7
2008	13	34	17	43	11
2009	9	39	25	53	17
2010	17	52	21	51	13
2011	12	46	32	53	14
2012	14	57	33	69	8
2013	24	57	26	88	19
2014	16	65	32	71	17
2015	20	74	45	95	19
2016	26	66	38	116	21



Research impact

The metric used to evaluate the quality and the impact of publications is based on citations count. It is computed as the number of publications that have been highly cited, having reached a given threshold of forward citations. Figure 3 shows the evolution of the share of publications that are in the top 10 citation percentile. The evidence on publications quality suggests that on average about 1 out of 5 publication ranked in top 10% most cited worldwide. We can also notice that the long term trend seem to be slightly increasing, even though citation patterns tend to fluctuate over time.

Figure 3: Share of UniTo publications related to Industry 4.0 in top 10 citation percentile expressed as a percentage, yearly from 1996 to 2016

Publication Year	Outputs in Top 10 Citation Percentile (%)
1996	9,52
1997	11,54
1998	9,76
1999	10,53
2000	14,71
2001	17,54
2002	22,86
2003	18,33
2004	13,92
2005	21,18
2006	23,96
2007	17,24
2008	23,73
2009	15,38
2010	16,88
2011	19,11
2012	18,78
2013	16,36
2014	13,43
2015	16,6
2016	23,97



4: Number of UniTo international co-authored publications related to Industry 4.0 yearly from 1996 to 2016

Publication Year	International Collaboration
1996	10
1997	26
1998	16
1999	20
2000	9
2001	21
2002	29
2003	25
2004	28
2005	35
2006	31
2007	38
2008	38
2009	42
2010	69
2011	50
2012	83
2013	81
2014	86
2015	102
2016	131



Internationalization

The interesting and promising evidence provided by the quality metric is confirmed by the data on the internationalization degree of the university publications. The extent of international collaboration is measured by counting the number of publications in which at least one co-author belongs to a foreign institution. The internationalization degree of Industry 4.0 related publications from 1996 to 2016 is shown in Figure 4. The data exhibit a pronounced increasing trend with a substantial acceleration during the last five years. It is worth noting that, comparing the number of internationally co-authored publication with the overall number of publication in Figure 1, the former are about half of the latter, indicating a strong tendency toward international collaborations. This increasing relevance of international co-authorships is also confirmed by the evidence on the research areas (Figure 5).

Figure 5: Number of UniTo international co-authored publications related to Industry 4.0 per research area yearly from 1996 to 2016

Publication Year	International Collaboration				
	Agriculture	Chemistry	Computer Science	Physics	Social Sciences
1996	-	3	0	7	0
1997	0	7	3	16	0
1998	0	7	1	8	0
1999	0	6	0	14	0
2000	0	4	1	4	-
2001	0	9	1	11	0
2002	1	8	4	15	1
2003	0	5	0	19	1
2004	-	12	5	11	0
2005	1	7	3	24	0
2006	2	10	5	13	1
2007	1	16	4	15	2
2008	6	11	6	13	2
2009	0	14	6	20	2
2010	5	22	13	25	4
2011	5	12	5	22	6
2012	5	21	13	40	4
2013	6	22	11	39	3
2014	6	22	14	36	8
2015	5	29	17	46	5
2016	8	30	19	63	11