



Identified Technologies Ranking

Positioning and ranking of technologies/applications accordingly with cross-sectoral matching matrix, relevance and feasibility

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Abstract

The purpose of this deliverable is to present a description of the activities and the process with regard to the identification and trade-off of potential technologies in order to position and rank the technologies accordingly with cross-sectoral matching matrix, relevance and feasibility. The activities of this deliverable have been executed in three main phases: 1) development of a list of technologies from both origin and destination sector and interlinkages, 2) development of ranking criteria 3) process of ranking technologies. This deliverable presents mainly the process of the identification and ranking of the technologies, while the results of each phase are discussed briefly. These results will be reanalysed in D2.4 ‘Sub-ranking of technologies/ applications accordingly with number of steps and funding needs and existing stakeholders’, where more criteria will be added to take into account the specificities of the funding possibilities within the ACTTiVate project.

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ACRONYM LIST

APU: Auxiliary Power Units

GPS: Global Positioning System

GNSS: Global Navigation Satellite System

ICT: Information and Communication Technology

MIT Technology Licensing Office: Massachusetts Institute of Technology

NDI Technologies: Non-Destructive Inspection

PEM: Proton Exchange Membrane

RFID: Radio Frequency Identification Device

SHM: Structural Health Monitoring

SiPM Sensors: Silicon PhotoMultiplier (photon device)

SME: Small and Medium size Enterprises

TECH: Technology

TRL: Technology Readiness Levels

1. INTRODUCTION

This deliverable presents a description of the activities and the process with regard to the identification and trade-off of potential technologies of Task 2.1.1.

The process included the following phases/steps/activities:

1. Development of a list of technologies from both origin and destination sector and interlinkages
 - a. Gathering and description of technologies
 - b. Division of technologies in fields
 - c. Division of technologies from origin to destination sector
2. Development of ranking criteria
 - a. Definition of the ranking criteria
 - b. Weight of different criteria
 - c. Adding costs to ranking criteria
3. Process of ranking technologies

Involved participants: Leader: WR (formerly LEI-WUR) Participants: MAC, PTS, INEGI, TP, FT, DCU, OOST, TP-AC, AFC

The purpose of this sub-task is to present a description of the activities and the process with regard to the identification and trade-off of potential technologies in order to position and rank the technologies accordingly with cross-sectoral matching matrix, relevance and feasibility.

This sub-task in WP2 is relevant to the project because it gives insight in the technologies and its state of art. In addition it is helpful when selecting the potential technologies in the different sectors and cross-overs with high potential.

2. PHASES OF THIS SUB-TASK

This sub-task has been executed in three main phases.

In the first phase of this task a long list of technologies was developed based on input from active organizations in each sector, including not only ACTTiVate partners but also other related and relevant organizations. The analysis of the identified technologies allowed the grouping of the technologies into the following fields: production technologies, protection systems, ICT tools, instruments and software, control systems and atomization, materials. For each technology the following information has been filled out:

- a) short description of the technology,
- b) origin sector(s),
- c) destination sector(s)
- d) TRLs (Technology Readiness Levels) of origin and destination sectors
- e) expected impact of this technologies on new value chain

Each technology from each origin sector was linked to a destination sector. A description of each technology was provided by the four research centres ACTTiVate partners: INEGI, WR, DCU and TP representing the different origin sectors. Within this phase there was a review of the technologies by involved partners to identify overlaps and bottlenecks.

In the second phase, criteria for definition and evaluation of relevance and feasibility were developed, established and discussed. This approach was in accordance with the guidelines proposed by the MIT Technology Licensing Office to evaluate the potential impact of a given technology into a defined economic sector.

For the origin sector, technology current TRL and number of European SMEs involved in this technology were given. When linked to the destination sector Current TRL, Expected TRL after ACTTiVate, Expected mid-term TRL, Impact in destination sector, Impact on end-consumer - chain – production, Number of European SMEs with potential interest as recipients were given each with their own scale and weighting in order to get the ranking. This information has been added, including market value and size, range of applications, foreseen trends and main stakeholders.

3. THE PROCESS AND THE RESULTS OF PHASE 1 - DEVELOPMENT OF A LONG LIST OF TECHNOLOGIES

In this phase, a total of 76 technologies have been identified, 22 technologies from aerospace as a sector of origin, 17 from agro-food, 18 from health, 19 from ICT as a sector of origin (see Fig 1).

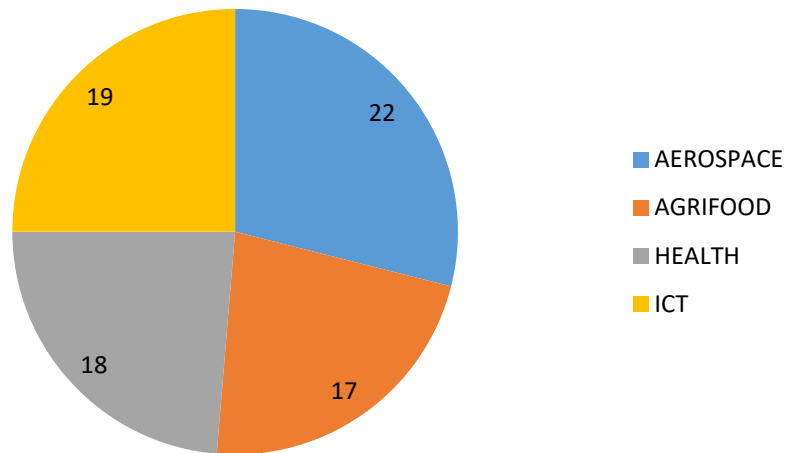


Figure 1. Number of identified technologies from the sectors of origin

Results revealed that from the 22 identified technologies originated in the **Aerospace** sector, 8 technologies have a good potential for agro-food purely as a destination sector and 4 for ICT only, and the rest for all three sectors: agro-food health and ICT as destination sectors (see Tale 1 below).

TECH field	TECH name	DESTINATION SECTOR
Production technologies	3D printing/ Additive Manufacturing	Health /Agrofood
Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Health/Agrofood
ICT tools, instruments and software	GPS and GNSS/ Radar technology/ Advances positioning services based on time-transfer techniques	ICT/Agrofood/Health
Materials	Light and High-strength Materials	Health/ICT/Agrofood
Production technologies	Light Structures/Light Structures for Transports	Health /ICT/Agrofood
Materials	nano-isolation material (aerogel)	Agrofood/Health
Control systems and automatization	Robotics	Agrofood
Production technologies	Natural Composites Design/Bio-inspired Structures	Agrofood/Health
Materials	Natural materials/fibers for Composites/Bio-inspired Materials	Agrofood/Health
Materials	Innovative materials/Conductive Materials/New materials (or tech) for medical devices	Agrofood/Health
Control systems and automatization	Climate/Weather Forecast	Agrofood
Control systems and automatization	Control Stations	ICT
ICT tools, instruments and software	Data Transmission and Links	ICT
Dissemination and exploitation	Flying Laboratory, Mobile/Stationary Laboratories	Agrofood
Control systems and automatization	Helmet Mounted Display	ICT
ICT tools, instruments and software	Integration of Communication Systems	ICT
Production technologies	Laser surface hardening	Health/ Agrofood
Production technologies	Proton Exchange Membrane or PEM fuel cells - H2 energy/ Portable Auxiliary Power Units (APU /Fuel cell technology	Agrofood
Control systems and automatization	Remotely Piloted Aircraft (drones)	Agrofood
Materials	Surface Protective Coatings	Agrofood
Control systems and automatization	Tribological diagnostic/monitoring	Agrofood
ICT tools, instruments and software	Vision Technology/ Vision based grading and sorting technology	Agrofood

Table 1. Consolidated Technological Matrix with sector of Origin Aerospace

Results revealed that from the 17 identified technologies originated in the **Agro-food** sector, 13 technologies have a potential for solely health as a destination sector, 2 for solely aerospace, and 2 for both aerospace and health. It is notable that no technology has been identified to be transferred from agro-food to ICT sector (see Table 2).

TECH field	TECH name	DESTINATION SECTOR
Control systems and automatization	Biological nanosensor/ nanomultisensor	Health
Control systems and automatization	Electrochemical Sensors	Aerospace/Health
Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Aerospace/Health
Control systems and automatization	Gene activity measurement method	Health
Production technologies	Bacteriophage antimicrobial agents	Health
Materials	Bio-based Compounds/Biodegradable packaging	Health
Production technologies	Biofactories	Health
Dissemination and exploitation	Bio-goods for Dissemination in Space/Plants growth in artificial conditions	Aerospace
Materials	Flexible multilayer polymer films	Health
Production technologies	Purification Based on Microalgae-Bacteria/microalgae-bacteria consortia based purification system	Health
Control systems and automatization	Auto-identification Systems	Health
Production technologies	ionization lamps	Health
Control systems and automatization	Pest dynamic population	Health
Production technologies	Plant extraction technology	Health
Production technologies	Plants growth in artificial conditions	Aerospace
Production technologies	Plasma activated water technology	Health
Control systems and automatization	Product Quality Monitoring	Health

Table 2. Consolidated Technological Matrix with sector of Origin Agro-food

Results revealed that from the 18 identified technologies originated in the **Health** sector, 12 technologies are applicable for agro-food, 1 for aerospace only and, the rest for both aerospace and agro-food. It is notable that as in the case of agro-food sector, no technology has been identified to be transferred from health to ICT sector (see Table 3).

TECH field	TECH name	DESTINATION SECTOR
Protection systems	Bioceramic Clothes	Aerospace/Agrofood
Control systems and automatization	Biological nanosensor/ nanomultisensor	Agrofood
Production technologies	Crystallization Device	Aerospace/Agrofood
Control systems and automatization	Electrochemical Sensors	Aerospace/Agrofood
Control systems and automatization	Enzymatic-based Detection Systems/Enzyme-free Detection System	Aerospace/Agrofood
Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Aerospace/Agrofood
Control systems and automatization	Gene activity measurement method	Agrofood
Control systems and automatization	Robotics	Agrofood
Production technologies	Purification Based on Microalgae-Bacteria/microalgae-bacteria consortia based purification system	Agrofood
Control systems and automatization	Chemical Goods and Medicines	Agrofood
Control systems and automatization	Handheld spectrometers/Laser Induced Breakdown Spectroscopes	Agrofood
Control systems and automatization	immunoenzymatic assay	Agrofood
Control systems and automatization	Lab on a chip Chromatography modules	Agrofood
Control systems and automatization	Microencapsulation	Agrofood
Control systems and automatization	Personalized Nutrition	Agrofood
Control systems and automatization	Precision diagnostics	Agrofood
Materials	Stable Materials	Aerospace
ICT tools, instruments and software	Wearable Health Devices	Agrofood

Table 3. Consolidated Technological Matrix with sector of Origin Health

Results revealed that from the 18 identified technologies originated in the **ICT** sector, 2 technologies are applicable solely for aerospace as a sector of destination, 7 technologies for agro-food sector only, 2 for the health sector only, and the rest is the combination of two or three sectors (see Table 4).

TECH field	TECH name	DESTINATION SECTOR
ICT tools, instruments and software	Behavioral analysis toolkit/ IT tools for recording and monitoring	Aerospace/Agrofood/Health
ICT tools, instruments and software	Internet of Things	Aerospace/Agrofood/Health
ICT tools, instruments and software	Big data general or for Anonymous Health System/Data Management Platforms/ Cloud computing/ e-commerce/Information systems/Big data or data analysis platform/software	Aerospace/Health/Agrofood
ICT tools, instruments and software	Computer Management Systems	Agrofood
Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Aerospace/Health/Agrofood
ICT tools, instruments and software	Gamification & virtual reality/ Augmented Reality/ Embedded systems	Aerospace/Agrofood/Health
Control systems and automatization	Robotics	Agrofood
ICT tools, instruments and software	Nutritional Software	Agrofood/Health
ICT tools, instruments and software	Modeling and Simulation/Product modeling/ Simulation Modelling	Agrofood/Aerospace
ICT tools, instruments and software	Artificial Intelligence	Agrofood
Control systems and automatization	Auto-identification Systems	Health/Agrofood/Aerospace
ICT tools, instruments and software	Artificial Intelligence	Agrofood
Control systems and automatization	Devices/Features for SHM	Aerospace
ICT tools, instruments and software	FarmBot (open source project)	Agrofood
ICT tools, instruments and software	Human Machine Interface	Health
Control systems and automatization	Information Management Systems/Product Quality Monitoring	Aerospace
ICT tools, instruments and software	Mobile Devices/Mobile Applications	Health
ICT tools, instruments and software	Optimization algorithm	Agrofood
Control systems and automatization	RFID and biometric identifiers	Agrofood

Table 4. Consolidated Technological Matrix with sector of Origin ICT

Summarizing the Matrixes presented above, it can be concluded that aerospace provides mostly technologies for agri-food sector, followed by health and ICT. Agro-food sector in its turn is a large provider of technologies for a health sector, where health sector is also providing technologies largely for agro-food sector, followed by aerospace. ICT sector is one of those with major number of technologies with potential to be transferred into agro-food, aerospace and health sectors. It is notable that ICT provides a large number of technologies to all sectors, but receives technologies only from aerospace sector.

4. THE PROCESS AND THE RESULTS OF PHASE 2 - DEVELOPMENT OF RANKING CRITERIA

Ranking criteria have been developed based on the following principles:

1. For the origin sector technology
 - a. *current TRL* - Shows the current maturity level of the technology and/or sub-technologies needed for this new value chain. Relates with technology availability
 - b. *number of European SMEs involved in this technology* - Reveals the reliability of the availability of expertise and capabilities to support this new value chain. Qualitative evaluation: Restricted, Few, Medium, Many, Widespread.
2. For destination sector technology
 - a. *Current TRL*- Current maturity and availability of the technology base for this cross-sectoral development. Also describes the penetration of the new technology in the destination sector.
 - b. *Expected TRL after ACTTiVate*- Deals with the short-term maturity of the technology upon success of the Action within ACTTiVate. Reveals what demonstration level will be reached within the Call for Proposals.
 - c. *Expected mid-term TRL*- Deals with the mid-term maturity of the technology after leverage from ACTTiVate.
 - d. *Impact in destination sector*- Socio-economic impact at regional/European level. Qualitative evaluation: High, Medium, Low.
 - e. *Impact on end-consumer /chain / production*- impact on health, safety, sustainability, well-being. Qualitative evaluation: High, Medium, Low.
 - f. *Number of European SMEs with potential interest* - Reveals potential for new consortia and value chains directly between SMEs at European level. Qualitative evaluation: Restricted, Few, Medium, Many, Widespread.

In order to be able to rank the technologies with all the above-mentioned criteria weights and scales have been attached. These weights and scales allowed to calculate a total score of the technologies transferred from origin sector to destination sector. The example of the developed ranking with criteria, weights and scales can be found in Table below.

Technology reference	Weight for the criteria	Scale for the criteria
Origin sector		
Current TRL	15%	1 - TRL 1-2 2 - TRL 3-4 3 - TRL 5-6 4 - TRL 7-8 5 - TRL 8-9
Number of European SMEs involved in this technology (origin)	10%	1 - Restricted 2 - Few 3 - Medium 4 - Many 5 - Widespread
Destination sector		
Current TRL	15%	5 - TRL 1-2 4 - TRL 3-4 3 - TRL 5-6 2 - TRL 7-8 1 - TRL 8-9
Expected TRL after AcTTIVate	5%	1 - TRL 1-2 2 - TRL 3-4 3 - TRL 5-6 4 - TRL 7-8 5 - TRL 8-9
Expected mid-term TRL	5%	1 - TRL 1-2 2 - TRL 3-4 3 - TRL 5-6 4 - TRL 7-8 5 - TRL 8-9
Impact in destination sector	20%	1 - Low 3 - Medium 5 - High
Impact on end consumer - chain - production	20%	1 - Low 3 - Medium 5 - High
Number of European SMEs with potential interest as recipients	10%	1 - Restricted 2 - Few 3 - Medium 4 - Many 5 - Widespread
	100.0%	TOTAL SCORE 1-5

Table 5 Technology ranking criteria, weights and scales

5. PROCESS AND RESULTS OF PHASE 3- PROCESS OF RANKING TECHNOLOGIES

Based on the information, procedures, and criteria defined in phase 1 and 2, the ACTTiVate R&D centers who have expertise in each of the sectors provided the necessary information and the technologies have been ranked. The ranking results of the consolidated technological matrix with ranking scores are summarized in 4 Tables below (Table 6-9), each table representing one destination sector.

REF	TECHNOLOGY	SHORT NAME	ORIGIN SECTOR	RANKING: DESTINATION SECTOR - AEROSPACE
65	Production technologies	Plants growth in artificial conditions	Agrofood	4.43
16	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Agrofood	4.38
17	ICT tools, instruments and software	Gamification & virtual reality/ Augmented Reality/ Embedded systems	ICT	4.30
10	Control systems and automatization	Electrochemical Sensors	Agrofood	4.23
36	ICT tools, instruments and software	Modelling and Simulation/Product modelling/ Simulation Modelling	ICT	4.20
47	Control systems and automatization	Devices/Features for SHM	ICT	4.20
40	Control systems and automatization	Auto-identification Systems	ICT	4.10
14	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Health	4.08
15	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	ICT	4.08
33	Dissemination and exploitation	Bio-goods for Dissemination in Space/Plants growth in artificial conditions	AgroFood	4.03
11	Control systems and automatization	Electrochemical Sensors	Health	4.00
55	Control systems and automatization	Information Management Systems/Product Quality Monitoring	ICT	3.95
4	ICT tools, instruments and software	Internet of Things	ICT	3.58
5	ICT tools, instruments and software	Big data general or for Anonymous Health System/Data Management Platforms/ Cloud computing/ e-commerce/Information systems/Big data or data analysis platform/software	ICT	3.50
72	Materials	Stable Materials	Health	3.45
12	Control systems and automatization	Enzymatic-based Detection Systems/Enzyme-free Detection System	Health	3.25
9	Production technologies	Crystallization Device	Health	2.65
3	ICT tools, instruments and software	Behavioural analysis toolkit/ IT tools for recording and monitoring	ICT	2.18
2	Protection systems	Bioceramic Clothes	Health	2.15

Table 6. Consolidated technological matrix with destination sector Aerospace

REF	TECHNOLOGY	SHORT NAME	ORIGIN SECTOR	RANKING: DESTINATION SECTOR - AGROFOOD
4	ICT tools, instruments and software	Internet of Things	ICT	4.23
5	ICT tools, instruments and software	Big data general or for Anonymous Health System/Data Management Platforms/ Cloud computing/ e-commerce/Information systems/Big data or data analysis platform/software	ICT	4.23
40	Control systems and automatization	Auto-identification Systems	ICT	4.20
23	Materials	Nano-isolation material (aerogel)	Aerospace	4.05
20	ICT tools, instruments and software	GPS and GNSS/ Radar technology/ Advances positioning services based on time-transfer techniques	Aerospace	4.00
11	Control systems and automatization	Electrochemical Sensors	Health	3.98
44	Control systems and automatization	Climate/Weather Forecast	Aerospace	3.88
62	Control systems and automatization	Personalized Nutrition	Health	3.88
36	ICT tools, instruments and software	Modelling and Simulation/Product modelling/ Simulation Modelling	ICT	3.70
50	Control systems and automatization	Handheld spectrometers/Laser Induced Breakdown Spectroscopes	Health	3.70
14	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Health	3.40
13	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Aerospace	3.40
27	ICT tools, instruments and software	Nutritional Software	ICT	3.28
71	Control systems and automatization	RFID and biometric identifiers	ICT	3.25
59	Control systems and automatization	Microencapsulation	Health	3.25
7	Control systems and automatization	Biological nanosensor/ nanomultisensor	Health	3.18
25	Control systems and automatization	Robotics	Aerospace	3.15
26	Control systems and automatization	Robotics	ICT	3.15
69	Production technologies	Proton Exchange Membrane or PEM fuel cells - H2 energy/ Portable Auxiliary Power Units (APU)	Aerospace	3.08
15	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	ICT	3.00
73	Materials	Surface Protective Coatings	Aerospace	3.00
19	Control systems and automatization	Gene activity measurement method	Health	2.98
24	Control systems and automatization	Robotics	Health	2.95
41	ICT tools, instruments and software	Artificial Intelligence	ICT	2.95
48	ICT tools, instruments and software	FarmBot (open source project)	ICT	2.80
70	Control systems and automatization	Remotely Piloted Aircraft (drones)	Aerospace	2.68
34	Materials	Innovative materials/Conductive Materials/New materials (or tech) for medical devices	Aerospace	2.60
75	ICT tools, instruments and	Vision Technology/ Vision based grading and sorting technology	Aerospace	2.58

	software			
76	ICT tools, instruments and software	Wearable Health Devices	Health	2.48
61	ICT tools, instruments and software	Optimization algorithm	ICT	2.43
9	Production technologies	Crystallization Device	Health	2.40
2	Protection systems	Bioceramic Clothes	Health	2.40
17	ICT tools, instruments and software	Gamification & virtual reality/ Augmented Reality/ Embedded systems	ICT	2.40
12	Control systems and automatization	Enzymatic-based Detection Systems/Enzyme-free Detection System	Health	2.40
29	Materials	Natural materials/fibres for Composites/Bio-inspired Materials	Aerospace	2.38
38	Production technologies	Purification Based on Microalgae-Bacteria/microalgae-bacteria consortia based purification system	Health	2.35
8	ICT tools, instruments and software	Computer Management Systems	ICT	2.33
21	Materials	Light and High-strength Materials	Aerospace	2.30
22	Production technologies	Light Structures/Light Structures for Transports	Aerospace	2.30
1	Production technologies	3D printing/ Additive Manufacturing	Aerospace	2.30
67	Control systems and automatization	Precision diagnostics	Health	2.30
28	Production technologies	Natural Composites Design/Bio-inspired Structures	Aerospace	2.28
57	Control systems and automatization	Lab on a chip Chromatography modules	Health	2.25
54	Control systems and automatization	Immunoenzymatic assay	Health	2.20
74	Control systems and automatization	Tribological diagnostic/monitoring	Aerospace	2.20
43	Control systems and automatization	Chemical Goods and Medicines	Health	2.18
49	Dissemination and exploitation	Flying Laboratory, Mobile/Stationary Laboratories	Aerospace	2.18
3	ICT tools, instruments and software	Behavioural analysis toolkit/ IT tools for recording and monitoring	ICT	2.18
58	Production technologies	Laser surface hardening	Aerospace	2.05

Table7. Consolidated technological matrix with destination sector Agro-food



REF	TECHNOLOGY	SHORT NAME	ORIGIN SECTOR(S)	RANKING: DESTINATION SECTOR - HEALTH
16	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Agrofood	4.40
18	Control systems and automatization	Gene activity measurement method	AgroFood	4.40
58	Production technologies	Laser surface hardening	Aerospace	4.35
68	Control systems and automatization	Product Quality Monitoring	Agrofood	4.35
10	Control systems and automatization	Electrochemical Sensors	Agrofood	4.25
31	Materials	Bio-based Compounds/Biodegradable packaging	Agrofood	4.23
4	ICT tools, instruments and software	Internet of Things	ICT	4.23
17	ICT tools, instruments and software	Gamification & virtual reality/ Augmented Reality/ Embedded systems	ICT	4.18
53	Production technologies	ionisation lamps	AgroFood	4.15
3	ICT tools, instruments and software	Behavioral analysis toolkit/ IT tools for recording and monitoring	ICT	4.15
1	Production technologies	3D printing/ Additive Manufacturing	Aerospace	4.13
13	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Aerospace	4.10
15	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	ICT	4.10
52	ICT tools, instruments and software	Human Machine Interface	ICT	4.10
5	ICT tools, instruments and software	Big data general or for Anonymous Health System/Data Management Platforms/ Cloud computing/ e-commerce/Information systems/Big data or data analysis platform/software	ICT	4.08
29	Materials	Natural materials/fibres for Composites/Bio-inspired Materials	Aerospace	4.00
28	Production technologies	Natural Composites Design/Bio-inspired Structures	Aerospace	4.00
23	Materials	nano-isolation material (aerogel)	Aerospace	3.70
66	Production technologies	Plasma activated water technology	AgroFood	3.68
35	Materials	Flexible multilayer polymer films	AgroFood	3.53
34	Materials	Innovative materials/Conductive Materials/New materials (or tech) for medical devices	Aerospace	3.45
21	Materials	Light and High-strength Materials	Aerospace	3.45
22	Production technologies	Light Structures/Light Structures for Transports	Aerospace	3.45
6	Control systems and automatization	Biological nanosensor/ nanomultisensor	AgroFood	3.38
40	Control systems and automatization	Auto-identification Systems	ICT	3.33
60	ICT tools, instruments and software	Mobile Devices/Mobile Applications	ICT	3.33
20	ICT tools, instruments and software	GPS and GNSS/ Radar technology/ Advances positioning services based on time-transfer techniques	Aerospace	3.28
42	Control systems and automatization	Auto-identification Systems	AgroFood	3.25
36	ICT tools, instruments and software	Modelling and Simulation/Product modelling/ Simulation Modelling	ICT	3.13

27	ICT tools, instruments and software	Nutritional Software	ICT	2.90
30	Production technologies	Bacteriophage antimicrobial agents	AgroFood	2.68
37	Production technologies	Purification Based on Microalgae-Bacteria/microalgae-bacteria consortia based purification system	Agrofood	2.68
64	Production technologies	Plant extraction technology	AgroFood	2.50
32	Production technologies	Biofactories	AgroFood	2.00
63	Control systems and automatization	Pest dynamic population	AgroFood	1.78

Table 8. Consolidated technological matrix with destination sector Health

REF	TECHNOLOGY	SHORT NAME	ORIGIN SECTOR	RANKING: DESTINATION SECTOR - ICT
20	ICT tools, instruments and software	GPS and GNSS/ Radar technology/ Advances positioning services based on time-transfer techniques	Aerospace	3.35
21	Materials	Light and High-strength Materials	Aerospace	3.30
22	Production technologies	Light Structures/Light Structures for Transports	Aerospace	3.30
56	ICT tools, instruments and software	Integration of Communication Systems	Aerospace	3.08
45	Control systems and automatization	Control Stations	Aerospace	2.83
51	Control systems and automatization	Helmet Mounted Display	Aerospace	2.48
46	ICT tools, instruments and software	Data Transmission and Links	Aerospace	2.33

Table 9. Consolidated technological matrix with destination sector ICT

6. CONCLUSIONS

The criteria for evaluating the listed technologies for cross-sectoral ranking has been defined, the necessary information about each technology has been gathered by ACTTiVate R&D centres specialists in each sector and, finally, the technologies have been ranked by each destination sector. The final rankings are presented in tables 6 to 9.

This ranking considered only technical and impact aspects for each technology. Now, it must be refined taking into consideration the appropriateness of the technology transfer process to the ACTTiVate funding scheme. The final ranking of technologies will be presented in D2.4 ‘Sub-ranking of technologies/ applications accordingly with number of steps and funding needs and existing stakeholders’.

ANNEX

Technology table ACTTivAte

REF	TECHNOLOGY	SHORT NAME	Origin Sector	Destination Sector
1	Production technologies	3D printing/ Additive Manufacturing	Aerospace	Health Agrofood
2	Protection systems	Bioceramic Clothes	Health	Aerospace Agrofood
3	ICT tools, instruments and software	Behavioural analysis toolkit/ IT tools for recording and monitoring	ICT	Aerospace Agrofood Health
4	ICT tools, instruments and software	Internet of Things	ICT	Aerospace Agrofood Health
5	ICT tools, instruments and software	Big data general or for Anonymous Health System/Data Management Platforms/ Cloud computing/ e-commerce/Information systems/Big data or data analysis platform/software	ICT	Aerospace Health Agrofood
6	Control systems and automatization	Biological nanosensor/ nanomultisensor	AgroFood	Health
7	Control systems and automatization	Biological nanosensor/ nanomultisensor	Health	Agrofood
8	ICT tools, instruments and software	Computer Management Systems	ICT	Agrofood ICT
9	Production technologies	Crystallization Device	Health	Aerospace Agrofood
10	Control systems and automatization	Electrochemical Sensors	Agrofood	Aerospace Health
11	Control systems and automatization	Electrochemical Sensors	Health	Aerospace Agrofood
12	Control systems and automatization	Enzymatic-based Detection Systems/Enzyme-free Detection System	Health	Aerospace Agrofood
13	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Aerospace	Health Agrofood
14	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Health	Aerospace Agrofood
15	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	ICT	Aerospace Health Agrofood
16	Control systems and automatization	Sensing/ Analytics/ Advice Systems/Early Warning Systems/Integration of Different Sensors/Sensing technologies/lab-on-a-chip/NDI Technologies/ SiPM Sensors/ Applications in Remote Sensing	Agrofood	Aerospace Health
17	ICT tools, instruments and software	Gamification & virtual reality/ Augmented Reality/ Embedded systems	ICT	Aerospace Agrofood Health
18	Control systems and automatization	Gene activity measurement method	AgroFood	Health
19	Control systems and automatization	Gene activity measurement method	Health	Agrofood
20	ICT tools, instruments and software	GPS and GNSS/ Radar technology/ Advances positioning services based on time-transfer techniques	Aerospace	ICT Agrofood Health
21	Materials	Light and High-strength Materials	Aerospace	Health ICT Agrofood
22	Production technologies	Light Structures/Light Structures for Transports	Aerospace	Health ICT Agrofood
23	Materials	nano-isolatiematerial (aerogel)	Aerospace	Agrofood Health
24	Control systems and automatization	Robotics	Health	Agrofood
25	Control systems and	Robotics	Aerospace	Agrofood

	automatization			
26	Control systems and automatization	Robotics	ICT	Agrofood
27	ICT tools, instruments and software	Nutritional Software	ICT	Agrofood Health
28	Production technologies	Natural Composites Design/Bio-inspired Structures	Aerospace	Agrofood Health
29	Materials	Natural materials/fibres for Composites/Bio-inspired Materials	Aerospace	Agrofood Health
30	Production technologies	Bacteriophage antimicrobial agents	AgroFood	Health
31	Materials	Bio-based Compounds/Biodegradable packaging	Agrofood	Health
32	Production technologies	Biofactories	AgroFood	Health
33	Dissemination and exploitation	Bio-goods for Dissemination in Space/Plants growth in artificial conditions	AgroFood	Aerospace
34	Materials	Innovative materials/Conductive Materials/New materials (or tech) for medical devices	Aerospace	Agrofood Health
35	Materials	Flexible multilayer polymer films	AgroFood	Health
36	ICT tools, instruments and software	Modelling and Simulation/Product modelling/ Simulation Modelling	ICT	Agrofood Aerospace
37	Production technologies	Purification Based on Microalgae-Bacteria/microalgae-bacteria consortia based purification system	Agrofood	Health
38	Production technologies	Purification Based on Microalgae-Bacteria/microalgae-bacteria consortia based purification system	Health	Agrofood
39	ICT tools, instruments and software	Artificial Intelligence	ICT	Agrofood
40	Control systems and automatization	Auto-identification Systems	ICT	Health Agrofood Aerospace
41	ICT tools, instruments and software	Artificial Intelligence	ICT	Agrofood
42	Control systems and automatization	Auto-identification Systems	AgroFood	Health
43	Control systems and automatization	Chemical Goods and Medicines	Health	Agrofood
44	Control systems and automatization	Climate/Weather Forecast	Aerospace	Agrofood
45	Control systems and automatization	Control Stations	Aerospace	ICT
46	ICT tools, instruments and software	Data Transmission and Links	Aerospace	ICT
47	Control systems and automatization	Devices/Features for SHM	ICT	Aerospace
48	ICT tools, instruments and software	FarmBot (open source project)	ICT	Agrofood
49	Dissemination and exploitation	Flying Laboratory, Mobile/Stationary Laboratories	Aerospace	Agrofood
50	Control systems and automatization	Handheld spectrometers/Laser Induced Breakdown Spectroscopes	Health	Agrofood
51	Control systems and automatization	Helmet Mounted Display	Aerospace	ICT
52	ICT tools, instruments and software	Human Machine Interface	ICT	Health
53	Production technologies	ionisation lamps	AgroFood	Health
54	Control systems and automatization	immunoenzymatic assay	Health	Agrofood
55	Control systems and automatization	Information Management Systems/Product Quality Monitoring	ICT	Aerospace
56	ICT tools, instruments and software	Integration of Communication Systems	Aerospace	ICT
57	Control systems and automatization	Lab on a chip Chromatography modules	Health	Agrofood
58	Production technologies	Laser surface hardening	Aerospace	Health Agrofood
59	Control systems and	Microencapsulation	Health	Agrofood

	automatization			
60	ICT tools, instruments and software	Mobile Devices/Mobile Applications	ICT	Health
61	ICT tools, instruments and software	Optimization algorithm	ICT	Agrofood
62	Control systems and automatization	Persolanised Nutrition	Health	Agrofood
63	Control systems and automatization	Pest dynamic population	AgroFood	Health
64	Production technologies	Plant extraction technology	AgroFood	Health
65	Production technologies	Plants growth in artificial conditions	Agrofood	Aerospace
66	Production technologies	Plasma activated water technology	AgroFood	Health
67	Control systems and automatization	Precision diagnostics	Health	Agrofood
68	Control systems and automatization	Product Quality Monitoring	Agrofood	Health
69	Production technologies	Proton Exchange Membrane or PEM fuel cells - H2 energy/ Portable Auxiliary Power Units (APU)/ Portable Auxiliary Power Units /Fuel cell technology	Aerospace	Agrofood
70	Control systems and automatization	Remotely Piloted Aircraft (drones)	Aerospace	Agrofood
71	Control systems and automatization	RFID and biometric identifiers	ICT	Agrofood
72	Materials	Stable Materials	Health	Aerospace
73	Materials	Surface Protective Coatings	Aerospace	Agrofood
74	Control systems and automatization	Tribological diagnostic/monitoring	Aerospace	Agrofood
75	ICT tools, instruments and software	Vision Technology/ Vision based grading and sorting technology	Aerospace	Agrofood
76	ICT tools, instruments and software	Wearable Health Devices	Health	Agrofood