Application of Design Thinking for Technology Transfer of Remotely Piloted Aircraft Systems for the Creative Industry

V. Santamarina Campos, M. de Miguel Molina, B. de Miguel Molina, M. Á. Carabal Montagud

Abstract—With this contribution, we want to show a successful example of the application of the Design Thinking methodology, in the European project 'Technology transfer of Remotely Piloted Aircraft Systems (RPAS) for the creative industry'. The use of this methodology has allowed us to design and build a drone, based on the real needs of prospective users. It has demonstrated that this is a powerful tool for generating innovative ideas in the field of robotics, by focusing its effectiveness on understanding and solving real user needs. In this way, with the support of an interdisciplinary team, comprised of creatives, engineers and economists, together with the collaboration of prospective users from three European countries, a non-linear work dynamic has been created. This teamwork has generated a sense of appreciation towards the creative industries, through continuously adaptive, inventive, and playful collaboration and communication, which has facilitated the development of prototypes. These have been designed to enable filming and photography in interior spaces, within 13 sectors of European creative industries: Advertising, Architecture, Fashion, Film, Antiques and Museums, Music, Photography, Televison, Performing Arts, Publishing, Arts and Crafts, Design and Software. Furthermore, it has married the real needs of the creative industries, with what is technologically and commercially viable. As a result, a product of great value has been obtained, which offers new business opportunities for small companies across this sector.

Keywords—Design thinking, design for effectiveness, methodology, active toolkit, storyboards, storytelling, PAR, focus group, innovation, RPAS, indoor drone, robotics, TRL, aerial film, creative industries, end-users.

I. INTRODUCTION

AERIAL photography and filming represents an indispensable resource for the Creative Industries (CIs) that perform activities like advertising campaigns, TV news production, cinematography productions, events filming, or registration of artworks and heritage sites. Moreover, in the film sector and in the video game industry, motion capture is used to obtain the most realistic results. When filming in indoor spaces, firms use auxiliary devices such as *cable cams, camera rails, jibs, scaffolds or lifting platforms,* enabling to

Virginia Santamarina Campos is Associate Professor at the Department of Conservation and Restoration of Cultural Heritage, Universitat Politècnica de València, Spain (phone: +34 963879314; e-mail: virsanca@upv.es).

María de Miguel Molina and Blanca de Miguel Molina re Associate Professors at the Department of Management, Universitat Politècnica de València, Spain (phone: +34 963877680; fax: +34 963877689; e-mail: mademi@omp.upv.es, bdemigu@omp.upv.es).

M. A. Angeles Carabal Montagud is Associate Professor at the Department of Conservation and Restoration of Cultural Heritage, Universitat Politècnica de València, Spain (phone: +34 963879314; e-mail: macamon@crbc.upv.es).

take special camera shots or to perform graphical surveying and recording of built heritage [1].

With the rise of *Remotely Piloted Aircraft Systems* (RPAS), commonly known as drones, CIs are increasingly focusing on its use for outdoor aerial photography and filming, since RPAS provide significant advantages over current photography and filming techniques:

- Expansion of creative spaces and movement of the camera. Classical filming equipment is normally not adequate when shorter distances to the object are required. The use of RPAS overcomes this problem and additionally adds more possibilities of free movements for the camera operator.
- Less risky. Possible safety risks for the cinematographer, when trying to obtain special shots (different angles, perspectives and heights), led to the need to climb up a scaffold, ladder or lifting platform to get professional results. When shooting films with RPAS, there is less risk.
- Less invasive. When shooting a film, the director has to plan carefully the set up and take care that auxiliary equipment does not obstruct a passage. RPAS, compared to classical equipment, are small sized, mobile and do not need any supporting means. Thus, in summary, they invade less the film set.
- Removal of complex and bulky infrastructure. Auxiliary means like cable cams, jibs, scaffolds etc. can be delated. Accordingly, logistics are easier and cheaper: assembly and disassembly are faster, and to transport RPAS requires less space.
- Affordable. As the general interest of RPAS increases, prices drop significantly and this creative tool is more accessible for small companies.

II. PROBLEM ANALYSIS – NEED

Although RPAS offer great advantages and creative possibilities, they are primarily designed for outdoor use by different end-users, such as inspections, agriculture, real estate, security, etc. The CIs are starting to use RPAS for outdoor filming and photography. However, since existing RPAS lack of a precise, robust and affordable indoor positioning system, as well as advanced safety features, the control of any RPAS in indoor environments is particularly difficult and unsafe. It is therefore that RPAS are not being professionally employed indoors [2].

Currently there are three indoor positioning systems used in

World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
Vol:12, No:5, 2018

RPAS: 1) *VICON Motion Capture System*, 2) *Qualisys System* and 3) *Visual Positioning System* (VPS). The Vicon and Qualisys system are both based on a digital optical and video motion tracking system and are very precise, but their cost is high, around €200,000, which is unaffordable for small companies, especially in the CI sector. In turn, VPS, recently employed by some RPAS manufacturing companies due to its low price (e.g. DJI and Parrot), uses a pair of ultrasonic sensors combined with a downward facing camera, which is however very sensitive to changeable light conditions and textures, it is not precise enough, and provides only its position in z-axis with a height limitation of 2.5 m [2]. Due to their limitations (too expensive or imprecise), these specific RPAS indoor positioning systems are not being commonly used.

Apart from the positioning problem, CIs do not still employ RPAS inside buildings as they are *not equipped with a reliable safety system*. While outdoor RPAS fly higher and they are typically only near people during take-off and landing, indoor RPAS fly constantly near people and objects. Hence, three main risk scenarios have to be considered:

a)   Injury to the RPAS operator,
b)   injury to the public and
c)   general damage to property.

Therefore, there is a clear need to minimize the occurrence and impact of these risk scenarios, enabling the RPAS to be used in indoor environments.

III. MAIN OBJECTIVE

The main goal is to provide the SMEs of the Creative Industry with a tool that, by expanding their creative spaces, will help them to offer new services, which in turn it will increase their chances to grow within the European and international market. To accomplish this objective, AiRT project [3] (Arts indoor RPAS Technology Transfer) will *develop the world´s first indoor RPAS* specifically designed for professional use by the CIs. Therefore, AiRT system will include the following features:

-   Integration of novel indoor positioning system (IPS). One of the main innovations of AiRT RPAS is the integration of Pozyx´s novel IPS (patent-pending) based on ultra-wideband technology (UWB). As a result, a cm-accurate position in all axes of the RPAS within the indoor environment will be obtained.
-   Intelligent indoor flying system, providing the RPAS with a fully-autonomous flight control system. Therefore, we will integrate the latest technologies in IPS, 3D environment reconstruction and autonomous flight control, facilitating the user to fly easily and safely a RPAS indoor while ensuring the needed stability for high quality results.
-   Integration of latest active and passive safety measures. To start with, the RPAS will count with the latest active safety measures, as there are the novel IPS, redundant flight control system, proximity sensors, encryption of communications, and failsafe features such as return to

launch, in order to automatically avoid static and dynamic obstacles preventing safety risks in an unsafe situation. Additionally, the passive RPAS safety measures will be integral: design and material choice will provide a robust structure, being at the same time compact and lightweight, while the rotors will be protected by means of grids and the remaining components by its hull.

-   Professional control of camera, enabling to control remotely or even program in advance the recording or shooting of high quality videos and images, as well as to interchange the camera objectives, enabling the camera to adapt to the CI requirements.
-   Easy to use. Thanks to its intelligent indoor flight control system and user friendly Graphical user interface (GUI), AiRT RPAS could be navigated without being an expert pilot. In addition, the camera will be controlled independently from the RPAS, enabling, for instance, its control by two operators, one focused on the RPAS and another focused on the camera. Moreover, AiRT system could be operational on desktop, laptop, tablet, smartphone and remote control.
-   Cost-efficient. AiRT RPAS system will be sold at €9000, being highly competitive with current professional filming and photography material, while being much cheaper than buying or even renting current auxiliary devices, e.g. renting a scaffold a day is around €1300.

AiRT consortium brings together the Belgian ICT SME *Pozyx Labs*, which developed the innovative, affordable and highly accurate indoor position system based on a novel wireless radio technology called ultra-wideband (UWB), the Spanish RPAS manufacturer SME *AeroTools* with their modular RPAS platform, advanced safety measures and expertise in flight control systems, and the Creative Agency *Clearhead Media* which as an end-user will take care that the needs of CIs will be fulfilled. The Universitat Politècnica de Valencia, combines both expertise in CIs and ICT technologies, being the ideal partner to act as link between both disciplines and coordinate the successful execution of the present project.

IV. STAKEHOLDERS

The main objective of AiRT is to provide the CIs SMEs with a remotely piloted aircraft system (RPAS) specifically for indoor use, which will enable them to expand their creativity and offer new and improved services. Although the CIs comprises a large number of sectors such as, performing arts, music, publishing, design, fashion, TV and movie, the use of AiRT is focused only on those CI sectors which could employ our RPAS in indoor spaces for filming or photo shooting. Following, we detail the specific requirements of each of these subsectors with the purpose to tailor our solution according to their needs:

-   Advertising agencies provide a creative point of view to the marketing and branding strategies of their clients in order to promote and sell their products or services. These agencies are above all seeking to have more freedom of

World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
Vol:12, No:5, 2018

movement to explore new perspectives for their creative and artistic processes. At present, RPAS are unlocking an entirely new vantage point: making aerial footage convenient, fast, and cheap.

- Movie industry. The artistic part of film production includes a large number of activities such as location search, design and installation of set up, mounting supports for lighting and cameras, filming, special visual effects (VFX), audio and editing. All these different activities are time-consuming and expensive. Thus, filmmaking industries are seeking solutions which help them, on one hand to reduce costs and time, and, on the other hand, to expand their creative possibilities during the preparation- (visual planning and storyboard) and at the production stage (special camera shots, angles, heights, freedom of movement etc.).

- Photograph industry. Professional photography is highly competitive and, for this reason, offering a new and different service of high quality might make the difference to have success. That is why they are seeking for simple, but innovative techniques or tools, that allow to explore new perspectives and horizons. This includes, e.g., filming or photographing techniques which provide endless possibilities for camera angles that no other photographer could offer.

- Television is a media producing audio-visual programmes for the mass audiences. TV producers are known for their craft, originality and creativity. Therefore, to guarantee this, television directors are continuously exploring new techniques and adopting them quickly.

- Performing arts include theatre, dance, music (festivals), opera, magic, illusion and circus. These disciplines are often synonymous of movement, spontaneity and creativity. The used spaces usually have a certain number of different activities, and the assembly and disassembly of the entire set is quite usual. Consequently, static structures are not the best means to deliver a professional job. But moving elements could be included in the performance.

- Video game industry uses registration of indoor environments for the development or exploration of game scenarios. These records can be used as a first approximation/ development step to create more realistic video games. At the same time, this industry seeks for affordable and non-time-consuming solutions.

- Architecture and Heritage. Monitoring and inspecting the interiors of buildings is a typical task of architects. High resolution photos are used to perform graphical surveying and recording of built heritage, which is extremely helpful to detect deterioration processes. Indoor inspections of property face problems such as available space and the assembly /disassembly of auxiliary means. Architects are seeking for easy-to-use, fast and as less as possible space invading solutions (e.g. lifting platform in a church is impossible, while building up scaffolds is time-consuming).

V. THE DESIGN THINKING METHODOLOGY

With the aim of providing European CIs with an innovative tool that allows them to offer new services and grow in the international market, Design Thinking has been used as a working methodology. The implementation of this methodology has been aimed at understanding and solving the real needs of the CIs, in order to align their needs with a technologically feasible and commercially viable solution, increasing their competitiveness (Fig. 1).
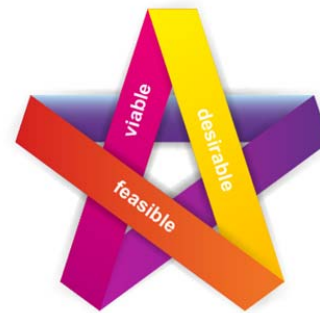

Fig. 1 Three criteria for design outcomes. Source: own elaboration, adapted from [4]

Therefore, we have focused on the design process of the AiRT system, leaving the final product in the background, integrating approaches from different fields by means of the participation of an interdisciplinary team made up of engineers, managers, economies, creatives and artists, whose objectives have been:

1. Empathize with the CIs to understand their problems and desires.
2. Generate collaborative, manipulative and playful activities with end-users that allow participants to take advantage of their potential, working on both the creative and analytical aspects, thus obtaining a better systemic model that synthesizes all points of view.
3. Develop prototypes, which are validated by end users, to identify possible failures, before generating the definitive solution.

Therefore, the project will be developed in five interrelated phases (Fig. 2), in which interaction with end-users will always be present.

1st Phase Empathize

The project began with a systematic understanding and observation of the needs of the end-users involved in the solution we are developing. The analysis of the needs of the CIs allowed us to obtain solutions consistent with their realities. In order to identify the users of the product, the Stakeholder Mapping technique was used, which allowed us to have a clear image of the users who had to intervene and participate in the analysis. Based on the stakeholder's map defined by the consortium, the key informants who participated in the definition of the object of the study were identified through three Focus Groups: one in Spain, one in Belgium and the last in the United Kingdom. The dynamics

World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
Vol:12, No:5, 2018

were prepared by means of a previous Documentary Investigation around the requirements related to aerial filming and photography, the use of drones and the security and data protection problems derived from them. The key informants chosen at this stage, from 13 different sectors of the CIs (Table I), were those who participated in the entire project process [1].

2nd Phase Define

In the definition phase, we filtered the information obtained in the previous stage, extracting what really brought value and led us to explore new perspectives. This step identified the problems whose solutions were key to an innovative outcome. To this end, an analysis of the needs of the CIs and ethical and risk issues was carried out through the processing of the information using the Qualitative Content Analysis method [5] and the Social Network Analysis (SNA) method [6] in order to codify and categorize the qualitative data. The results obtained at this stage formed the basis of the idea of the AiRT system.

TABLE I
DISTRIBUTION OF FOCUS-GROUPS PARTICIPANTS REGARDING THEIR AREA OF EXPERTISE

INFORMANT	Advertising	Architecture	Fashion	Movies	Antiques and Museums	Music	Photography	TV	Performing Arts	Publishing	Arts and Crafts	Design	Software
1				X		X		X	X	X			
2				X			X		X				
3	X							X			X		
4	X	X					X						
5	X			X		X	X					X	
6		X					X						
7	X			X							X		
8					X								
9	X						X						
10				X									
11	X						X						X
12				X			X						
13	X	X											
14		X			X		X	X					
15				X			X						
16				X			X						
17	X							X					
18			X	X				X					
19	X			X									
20	X		X			X	X						

World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
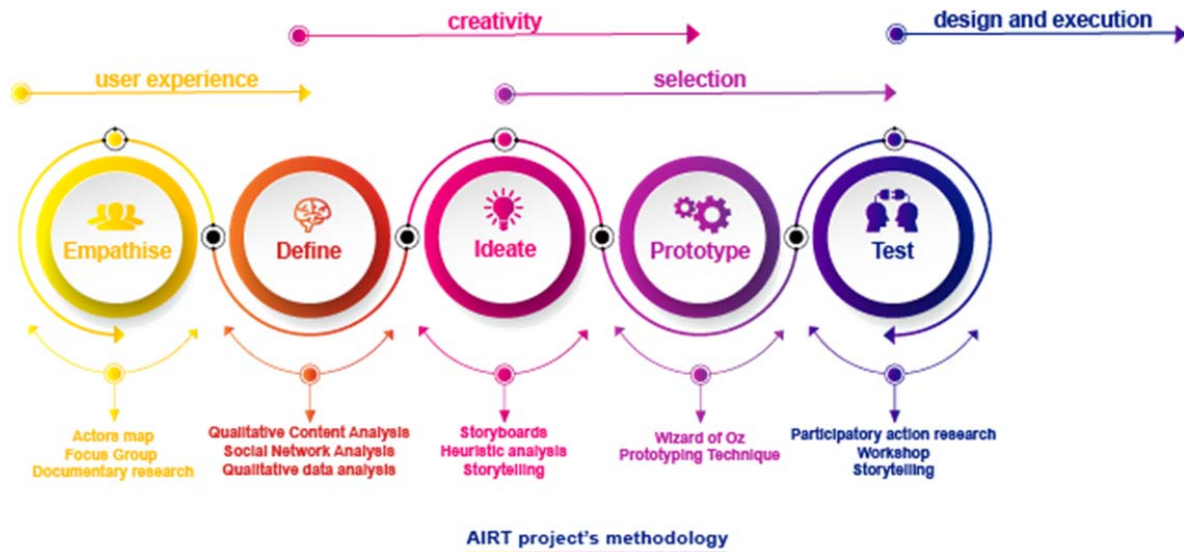Vol:12, No:5, 2018

Fig. 2 Detail of the Design Thinking methodology used in the AiRT project. Source: own elaboration [7]

3rd Phase Ideate

The ideation stage was aimed at both the CIs and the creative professionals that form part of the consortium, defining the functionalities to implement in the AiRT system and specifically in the GCS software. The value proposition would constitute the RPAS AiRT. To do this, starting from the identification of the needs carried out in the phase "define", written scripts were elaborated and later transferred to graphic scripts (storyboards) that represented the use of the AiRT system in different creative scenarios. The management of this tool favoured expansive thinking, generating multiple options and allowing programmers to communicate the main ideas learned in the previous phase directly and more clearly, without any value prejudices.

In relation to the usability and design aspects of the GCS software, a heuristic analysis of 30 different software programs for mapping and photogrammetry was carried out. The study was based on a structured guide in the form of a checklist, which included sections on accessibility, identity, navigation, content, consistency, shortcuts and responses to actions [7]. This analysis provided information of great relevance when defining aspects of usability for the GCS software. The "Ideate" phase ended with the elaboration of a storytelling, with the aim of connecting emotionally with the CIs through the history of the project idea. The objectives of this technique were:

1. To generate greater connection with end-users, appealing to their emotional side, making the project more human and bringing it closer to the people.
2. To build confidence in the CIs sector. Because, by telling the story of the project idea, we not only tell a reality in a different way, but also make it easier to show different aspects, from another point of view and in a closer way, that will generate confidence in our target audience.
3. To make it easy to remember. Fostering its transmission and increasing its viral effect. Turning the history of the project into something daily for the CIs.

4th Phase. Prototype

In this phase, the ideas expressed in the previous stages became true. We should bear in mind that the development of prototypes is not simply a way to validate ideas, but it is an integral part of the innovation process [8]. Therefore, at this stage, the integration of all the components was carried out and the functionalities of the AiRT system were implemented based on the prioritized requirements, with the objective of visualizing the solutions and identifying possible improvements. In this way, we proceeded to build a "fast" prototype that will connect with the idea of Minimum Viable Product (MVP) [9], with the aim of being able to check it as soon as possible, in the later "Test" phase with the participation of the CIs.

5th Phase. Test

During this stage, the target audience made use of the prototypes in two phases. In a first stage, the same experts who participated in the needs' identification phase were invited to use the prototypes in a selection of relevant scenarios in the three participating countries.

The objective of this first stage was that they could identify shortcomings or bring in new improvements, using the Participation Action Research (PAR) tool. The purpose of this type of technique is to obtain relevant data from key informants that allow subsequent interpretation and analysis of the facts from their experiences [10]. The dynamics were filmed using the technique of "undercover" observation, through the analysis of the filming of the sessions, using qualitative data analysis software. Once feedback was obtained from the experts of the CIs, conclusions were incorporated to improve the solution that we were looking for. In a future, our idea is to test it also with other industries. To this end, other industries will be invited to the "International Workshop on Drones & Technology Applied to the Creative Industry" to be held at the Universitat Politècnica de Valencia on 8 June 2018. In this event, we will present not only the

World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
Vol:12, No:5, 2018

entire development process and the main innovations achieved, but also a demonstration in a relevant space at the Science Museum Príncipe Felipe, designed by the Spanish architect Santiago Calatrava, which is situated in the City of Arts and Sciences (CAC) of Valencia. At the end of the project, a storytelling will be distributed on the social networks, to tell the story of the AiRT project, emphasizing that design process. It will show the apparent chaos and uncertainty, the thoughts "out of the box", the multiple ideas and paths – and how everything is clarified through research and prototyping. This story will have the objective that all industrial sectors appreciate the product and can observe how the solution is finally obtained.

Through storytelling, a summary of the entire design process can be presented, showing the approach and solution - simple and straightforward.

VI. CONCLUSIONS

Through the use of design thinking it has been possible to experiment how disruptive innovation and design are produced. And how a product that was originally born as something residual, focused on the CIs, can quickly become an innovative product for other industries [11]. On the other hand, from the management point of view, this tool has allowed us to change the way-of-doing-things into the interdisciplinary team of the project, having a great positive impact on the consortium and its results, including the exploitation plan. For this reason, we recommend it to be implemented in other similar projects.

ACKNOWLEDGMENT

REFERENCES

[1] V. Santamarina, B. De Miguel, M. Segarra, and M. De Miguel, "Importance of Indoor Aerial Filming for Creative Industries (CIs): Looking Towards the Future," in *Innovative Approaches to Tourism and Leisure*, Cham: Springer, 2018, pp. 51–66.
[2] V. Santamarina-Campos, M. Segarra-Oña, B. De-Miguel-Molina, and M. De-Miguel-Molina, "Transferring technology from the remotely piloted aircraft systems (RPAS) industry to the creative industry: Why and what for?," in *4th International Multidisciplinary Scientific Conference on Social Sciences and Arts*, 2017, pp. 107–114.
[3] "Airt Project" 2017. (Online). Available: http://airt.eu. (Accessed: 16-Mar-2018).
[4] T. Brown, "Desing Thinking," *Harvard Businnes Rev.*, pp. 84–92, 2008.
[5] P. Mayring, "Qualitative content analysis: theoretical foundation, basic procedures and software solution," *Sage, Klagenfurt*, no. October, 2014.
[6] S. P. Borgatti, A. Mehra, D. J. Brass, and G. Labianca, "Network analysis in the social sciences.," *Science*, vol. 323, no. 5916, pp. 892–5, Feb. 2009.
[7] L. Ball and T. Bothma, "The Importance of usability evaluation when Developing Digital tools for a library - a Case Study," in *Improving Quality of Life Through Information. Proceedings of the XXV Bobcatsss Symposium, Tampere, Finland, January 2017*, 2017, pp. 137–142.
[8] H. Plattner, "Bootcamp Bootleg," Institute of Design Thinking at Stanford, Stanford, 2010.
[9] E. Ries, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, vol. 258. 2011.
[10] V. Santamarina, E. M. Martínez, M. Á. Carabal, and M. De Miguel,

"Participatory action research (PAR) in contemporary community art," in *Conservation, tourism, and identity of contemporary community art*, V. Santamarina, M. Á. Carabal, M. De Miguel, and B. De Miguel, Eds. NJ: Apple Academic Press, 2017, pp. 105–136.
[11] C. M. Christensen, *The innovator's dilemma: the revolutionary book that will change the way you do business*, vol. 94, no. 2. HarperCollins, 2011.

Virginia Santamarina-Campos (Valencia, Spain, 1974), fine Arts Degree at the Universitat Politècnica de València (UPV), Spain, 1999. She has been visiting researcher in Italy and Mexico. Her specialization is related to Conservation and Restoration of Mural Art, and she received the National Award from the Ministry of Education, Culture and Sports for her final dissertation. She obtained her master's degree in Internet – Intranet Programming, UPV (2001) and her *PhD* in Conservation and Restoration of the Historic-Artistic Heritage, UPV (2003). The result of her doctoral research was a platform for self-learning and researching mural art that is used by several Latin-American universities. She also has a drone/UAV Pilot Training Certificate from the Fly School Air Academy, Spain, (2015).

Associate Professor at the UPV, Department of Conservation and Restoration of Cultural Heritage (Faculty of Fine Arts). Currently, she is also the coordinator of the Research micro-cluster "Globalisation, tourism and heritage" of the International Campus of Excellence. She is part of the aerial drone pilot commission which depends on the UPV Vice-President for Research, Innovation and Transfer. Her main research area is the social construction and sustainable management of street art, and creative heritage from a sustainable management perspective. Her studies incorporate the use of RPAS for the process of research and innovation, and provide new perspectives in relation to space and its integration in creative cities. In addition, she lectures in mural art and the creative industries.

In the last 5 years, she has conducted 8 international R&D projects supported by competitive calls and 10 R&D international contracts supported by public and private organizations. Their results are disseminated in published papers, national and international congress contributions, the organization of international workshops, research visits to Italy, Mexico, Uruguay and U.K., and the supervision of master's dissertations and doctoral theses. She is also currently coordinating AiRT, an EC funded project (Proposal 732433, H2020-ICT-2016-2017).

Blanca de-Miguel-Molina (Valencia, Spain, 1967). Economics Degree (Universitat de València, Valencia, Spain, 1991), International MBA (Ford - Anglia Ruskin University - Universitat Politècnica de València, Valencia, Spain, 1996), Master of Business Administration (Anglia Ruskin University, UK, 1998) and PhD in Management (Universitat Politècnica de València, Valencia, Spain, 2003). The author's major fields of study are Business Models and Services.

She is Associate Professor at Universitat Politècnica de València (Spain), Management Department, where she teaches courses in Service Strategy, Business Models and Service Design. She has published different papers and book chapters related to creative industries, such as, "Micro-geographies of creative industries clusters in Europe: From hot spots to assemblages" (Papers in Regional Science, 2015), "Creative service business and regional performance: evidence for the European regions" (Service Business. An International Journal, 2013) and "The importance of creative industry agglomerations in explaining the wealth of European Regions" (European Planning Studies, 2012). Research interests are the analysis of creative industries and the role of business in society through corporate philanthropy.

Prof. de-Miguel-Molina is member of the Asociación Española de Ciencia Regional (AECR) and of the European Regional Science Association (ERSA). At present, she participates in a H2020 European Project on "Technology transfer of Remotely Piloted Aircraft Systems (RPAS) for the creative industry (AiRT)".

María de-Miguel-Molina (Valencia, Spain, 1971), M.Sc. in Law, 1996, Universitat de València, Spain and PhD in Management, 2003, Universitat Politècnica de Valencia, Valencia, Spain. Major field of study, public management.

She is Associate Professor at Universitat Politècnica de València (Spain), Management Department, Faculty of Business Administration and Management, she teaches courses in Public Management, Research Methodologies and Data Protection. She has published different papers and book chapters related to public policies and management such as "E-Government in Spain: An Analysis of the Right to Quality E-Government" (2010), International Journal of Public Administration, "A Comparative

World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
Vol:12, No:5, 2018

Empirical Study on Mobile ICT Services, Social Responsibility and the Protection of Children" (2011), Science and Engineering Ethics, and "Balancing Uruguayan Identity and Sustainable Economic Development through Street Art" (2017), in Visiting Murals: Politics, Heritage and Identity (Heritage, Culture and Identity). Her research interests are related to public-private partnerships and community development through public strategies.

Prof. de-Miguel-Molina is member of the European Business Ethics Network (EBEN) and the Spanish Law & TICs Network (DerechoTics). At present, she participates in a H2020 European Project on "Technology transfer of Remotely Piloted Aircraft Systems (RPAS) for the creative industry (AiRT)".

María Ángeles. Carabal Montagud (Valencia, Spain, 1980), fine Arts Degree at the Universitat Politècnica de València (UPV), Spain, 2003. PhD in Conservation and Restoration of Cultural Heritage in 2009. She is professor in the Department of Conservation and Restoration of Cultural Heritage at the Universitat Politècnica de Valencia (UPV, Spain). She participates at the IRP (Institute of Heritage Restoration, UPV) in the research groups "Analysis and Intervention of Mural Art" and "Sustainable management of the cultural and natural heritage". Currently she is also membership of the Research micro-cluster VLC/CAMPUS "Globalization, tourism and heritage". Supervisor of different Doctoral, Master and Degree Dissertations.