REPORT

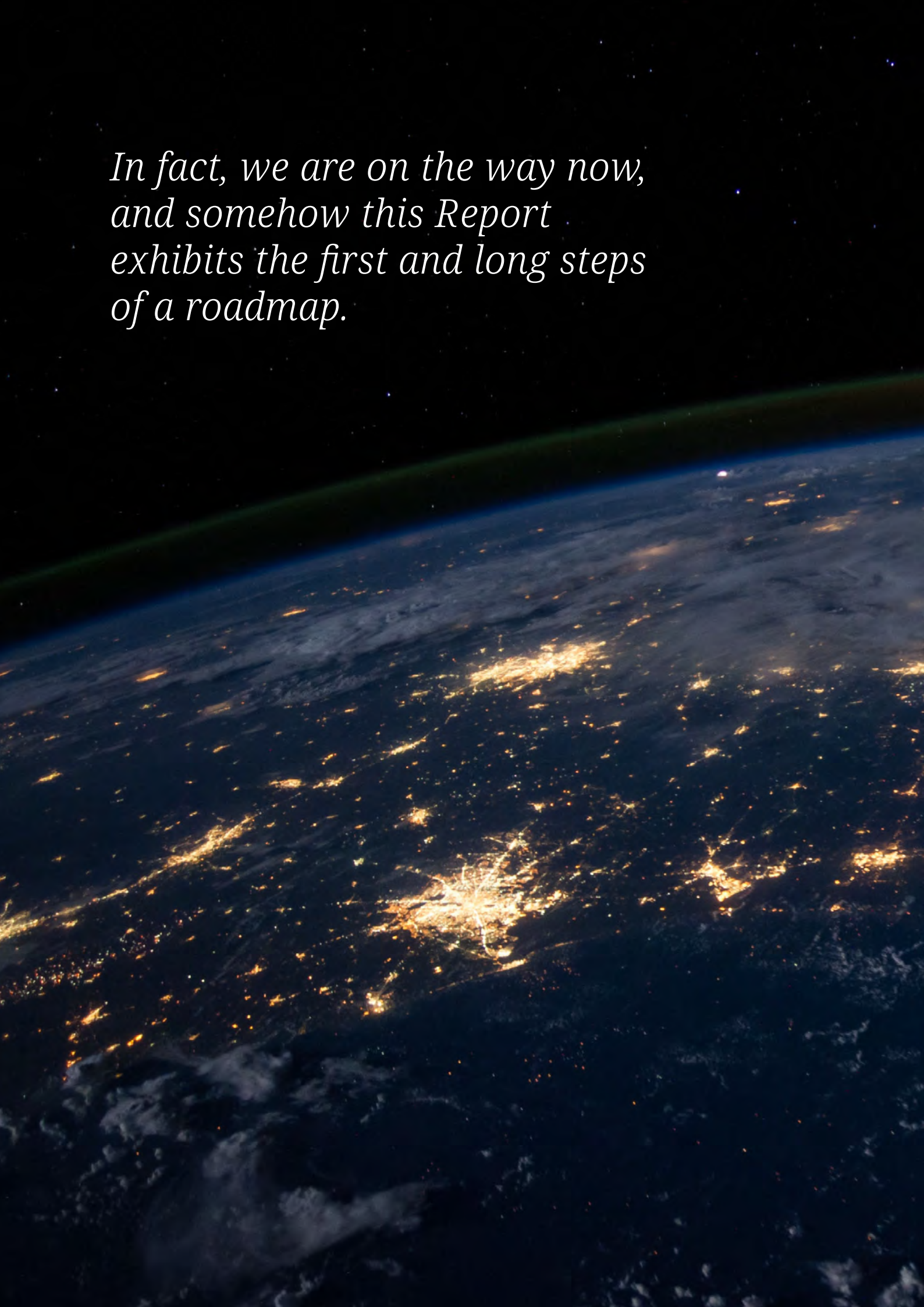
2017/2019

Information Processing and Telecommunications Center

ETSI Telecomunicación
Avda. Complutense 30
www.iptc.upm.es

TABLE OF CONTENTS

In fact, we are on the way now, and somehow this Report exhibits the first and long steps of a roadmap.



Preface

The Information Processing and Telecommunications Research Center (IP&T Center, IPTC) was created in 2016 by Universidad Politécnica de Madrid (UPM), following the initiative of a number of highly competitive and recognized research groups working in the fields of Electronics, Communications, Networks, Computing and Data Science and Engineering, with a strong vocation for innovation and internationalization.

In the short term, the basic objective was to consolidate the many successes achieved from the 80s in a new demanding scenario, through multidisciplinary cooperation. The envisaged mission was (and is) to grow as a strategic research and development joint unit in ICT, capable of addressing major scientific and technological challenges, by looking at the problems with a different disruptive view, and getting prepared to cooperate in a complex environment with other strong R&D stakeholders, to generate services with a high economic and social value.

During these few years, some hidden things became apparent, not least the collective awareness of the relevance of our activity and the understanding of the enormous, sometimes unsurmountable, difficulties of standing up a project like this. A lot of energy had to be devoted to define and implement the basic governance rules and bodies, the communication and dissemination tools and channels, from the web and the social network channels to the newsletters; and also, the construction of a wide consensus and the practical set-up of a focused cooperative environment.

Meanwhile, in the course of time, and doing things more than less as usual, and in spite of the difficulties of the period, our scientific and technological results proved to be excellent, both academically and from the innovation point of view: yearly, more than 100 competitive research projects and more than 60 non-competitive active ones, around 20 Ph.D. theses completed, 10 patents, with a research force of around 160 researchers on the average. We head the official rankings, year by year, among all the R&D Centers and Institutes of the UPM in Global Valuation, Fund Raising and Diffusion/Impact of Scientific Research Outcomes.

We, undoubtely, have margin for improvement, singularly to keep up in the mid-term in a good comparative situation with respect to other Centers, in the international arena, working in the same thematic field. And also to stay internationally relevant in the technologies and industrial sectors which have traditionally been in the core of our activity, and in some others which had not been in the past so much in our scope, but that they are now, such as the Fintech or the Manufacturing industries.

In order to extend our technological presence and prominence, we possibly would need to adopt a more disruptive attitude in relation with how and what we, successfully, already produce and deliver under the actual model of R&D Groups and the whole UPM model. The IPTC should serve to convey a number of strategic

collective undertakings. In fact, we are on the way now, and somehow this Report exhibits the first and long steps of a roadmap. On the one hand, the R&D Groups in IPTC have been improving their knowledge creation and transfer and renewed their partner networks around their traditional areas of Radio, Signal, Image, Data, Networks, Computing or Electronics, among others. The reported activities in this Memory, relative to publications, access to competitive financing or contracts with industries in the sectors of Defense, Space, Multimedia & Comms or ATM, just to name a few, show the health of our "traditional" competences and relationships.

But, at the same time, in the last two or three years, we have started a journey through a number of new (or not so new) promising horizontal/vertical initiatives which will probably shape part of our strategic roadmap. Principally, Digital Transformation, Future Telecoms and Data Science:

- *Technologies for Digital Transformation of the Industry*, which encompass from the Cloud to the IoT, and from the smart sensor-based diagnostics to the full XaaS. This panoply of enabling technologies, together with data-based industry and business operations management tools, is framing a picture of new approaches, augmented products and new business models.

- *Future Telecoms*, and in particular the world of 5G and beyond, where extra wide band for mobile communications, very low latency and high reliability for critical applications are envisaged. We are not only expecting improved performance in existing services but rather a new set of scenarios, where some brand-new concepts will be made practical. Technologies that leverage on virtualization, slicing concepts and openness and interoperability of hardware will probably compose a part of the IPTC´ focus.

- *Data Science and Engineering* and the spill-out of Data Analytics and Artificial Intelligence, which is an area in which not less than 8 Groups in IPTC have a proven record of more than 30 years (in the 90s we published as pioneers in the area of neural networks -today, Deep Learning- and we were a national reference in what it was called then adaptive-learning systems, which would soon converge semantically in the term Machine Learning). The IPTC has collectivelly reinforced its R&D stakes in Big Data & ArtificiaI Intelligence, with more than 50 financed projects in the last three years, in several basic and applied areas, including Telecommunications, Defense, Health, Smart Cities, Fintech or Transport.

The focus on these three and in some other emerging areas does not imply by no means that in the future we will progressively forget about e.g. Signals, Radio or Devices. On the contrary, integrative multidisciplinarity, from the basics to the service and from the algorithm to the machine, is our main distinctive asset and value.

This Memory intends to be only a partial compilation of some of the results obtained in the period. Although the irruption of COVID-19 prevented us from conclude it in a calm and collected way, we feel that it still contains a good summary of our activity in this taking-off period.

To finish this long preface, and not least, I would like to acknowledge the enormous amount of work devoted to this Memory by all the members of the Management Team, and the generous effort of the Academic Secretary.

José Ramón Casar Corredera
Director