

# IFKAD 2015

10th International Forum on Knowledge Asset Dynamics

## Culture, Innovation and Entrepreneurship: connecting the knowledge dots

PROCEEDINGS

10 - 12 June 2015

Bari - Italy

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*10<sup>th</sup> International Forum on Knowledge Asset Dynamics*

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## *Culture, Innovation and Entrepreneurship: connecting the knowledge dots*

# PROCEEDINGS

*Organized by:*

*Institute of Knowledge Asset Management*

*University of Basilicata*

*Arts for Business Ltd*

*Polytechnic University of Bari*

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## FOREWORD

A very warm welcome to the 10<sup>th</sup> edition of the International Forum on Knowledge Asset Dynamics (IFKAD 2015). We are pleased that this year's event is hosted by Polytechnic University of Bari, in Italy.

It is a very important edition since IFKAD reaches its decennial as one of the major and outstanding international events focused on knowledge-based development both at micro and macro level. This represents a great result gained through the growing interest, commitment and involvement of all the IFKAD community – chairmen, organizers, delegates, scientific committee, key-note speakers, journals' editors and publishers.

All this lets us to be happy about the goal reached, but at the same time challenges us to further improve overall performance of the conference, both on contents, journals' publication rates and event management level.

According to the high quality and large participation traditionally guaranteed, also this year IFKAD will bring together world-thought leaders, academicians, young researchers, practitioners and policy makers from different fields to provide an opportunity for discussing and debating on the strategic relevance and role of the knowledge-based value drivers characterizing the XXI century business landscape.

In particular, the aim is to explore the role and the relationships of three fundamental pillars of the success of XXI century organizations: culture, innovation and entrepreneurship. They serve each other and dynamically through a system of direct and indirect relationships. The relevance of these three dimensions for competitiveness is not new. However, in today's complex and volatile economic era the capacity of organizations, cities and territories of combining and integrating culture, innovation and entrepreneurship represent a fundamental source of sustainable value creation. They define three fundamental knowledge domains shaping and affecting learning organizational systems.

The programme of this year's conference is just as rich and enlightening as previous conferences. We have an exceptional line of keynote speakers who will share their research and practical insights as well as inspire new reflections and research paths. We have over 200 speakers and 40 countries are represented at the conference. This is further characterised by an excellent combination of papers from academia and practice. Presentations will be on issues as wide ranging as arts-based management, arts in business, culture and creativity-driven entrepreneurship, technology-driven entrepreneurship, culture as a driver of innovation, economic value creation and regional development, intellectual capital and knowledge management practices, learning methodologies supporting the development of an entrepreneurial attitude, social innovation and sustainability, as well on issues related to very interesting special tracks.

We are really honoured for your participation and we look forward to meet you in occasion of IFKAD 2016.

Conference co-chairs

*Vito Albino, Giovanni Schiuma, JC Spender*

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## The Internet of Things: emerging profiles

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### Structured Abstract

**Purpose** – The Internet of Things or, as John Chambers called it, the Internet of Everything represents the networked connection of people, process, data and things together in order to make connections more relevant and valuable than ever before.

In order to understand further this intelligent infrastructure, our contribution aims to investigate the Internet of Things by a revised conceptualization of the topic. The investigation has been carried out on a scientific contribution produced in the last twenty years for economic and corporate purpose, in order to comprehend and manage the new opportunities offered to economic activity from Internet of Things.

**Design/methodology/approach** – The paper is based on a qualitative approach with the inclusion of a single method approach. In this way, following an analysis of existing literature on the Internet of Things we have applied four keywords (Internet of Thing, Communication Internet, Energy Internet and Logistics Internet) in two databases (Google Scholar and Ebsco) to provide a range of scientific contributions to fill out the literature review. Research is developed according to the study of national and international literature.

**Originality/value** – The Internet of Things will connect everything to everyone in a connected network made up of a Communications Internet, Logistics Internet and Energy Internet in a single integrated system. It has been estimated that in 2020 over 200 billion

sensor devices will be connected, creating a market size that in 2025 will be between \$2.7 trillion and \$3 trillion per year. These devices promise efficiency, social and individual benefits through quantification and monitoring of previously immeasurable qualities. Therefore, the analysis of the literature on Internet of Things, in the time frame between 1995-2015, represents the method to fully appreciate the characteristics, opportunities, possible applications, risks and possible issues linked to the topic.

**Practical implications** – The electronic sensors are now ubiquitous everywhere. The connected sensor-based devices create new types and quantities of high quality information, opening up new opportunities to create services that will provide the society, the environment, the economy and individuals with tangible benefits. Our conceptualization aim to contribute to the identification of the main features, application scenarios and correspondent potential applications of Internet of Things, offering new ideas for further analysis.

**Keywords** – Internet of Thing, Communication Internet, Energy Internet, Logistics Internet, Companies, Big Data.

**Paper type** – Academic Research Paper

## 1 Introduction

Progress in the areas of smart devices embedded systems, computing, and networking (Trequattrini, *et al.*, 2012a) is creating an infrastructure consisting of millions of heterogeneous devices.

These devices, or "smart things" will not simply convey information but process it, and form advanced collaborations, in order to define the "Internet of Things" (IoT) infrastructure. IoT (Atzori, *et al.* 2010) together with the other emerging Internet developments such as Energy Internet, Communication Internet, and Logistic Internet are the mainstay of the digital economy, the digital society and the foundation for the future knowledge based economy (Foray, 2004) and innovation society.

Therefore, the line between the real and virtual world is blurring and will change the way we design, deploy, and use services. New opportunities can emerge for businesses, people and the society as a whole.

In order to understand further the phenomenon of the Internet of Things, its characteristics, opportunities, possible applications, risks and issues, our paper aims to make a accurate review of the literature on the topic.

The research approach adopted is based on a qualitative methodology, with the application of a single method approach. Through two database and four key words, the scientific contributions on the theme of Internet of Things have been searched, collected, and analysed in order to set up an updated conceptualization of the theme.

The structure of the paper is the following. After the introduction, section two analyses the literature related to the Internet of Things, Communication Internet, Energy Internet, Logistic Internet. Section three describes the research approach adopted. Section

four illustrates the quantitative research results. Section five illustrates the final consideration, the limitations and future perspectives of the study.

## 2 Literature Review

The Internet of Things (IoT) is an emerging global Internet-based information architecture of integrated networked connections, which includes the existing and evolving Internet and network developments.

The term was first coined by Kevin Ashton (Johnston, 2014), in 1999, to describe the internet connected devices. He asserted that IoT would have been able to offer advanced connectivity of devices, systems, and services that by going beyond machine-to-machine communications (M2M) covers a variety of protocols, domains, and applications.

Over the years, the term has become famous and was mentioned by many magazines (The Guardian, Boston Globe) so as to attract the attention of the International Telecommunication Union (ITU, 2005), which in its report defined it as a new dimension of Information and Communication Technology (Del Giudice and Straub, 2011).

The Internet of Things European Research Cluster conceptually defines the IoT as a dynamic global network infrastructure with self configuring capabilities based on standard and inter-operable communication protocols where physical and virtual “things” have identities, physical attributes, and virtual personalities, use intelligent interfaces, and are seamlessly integrated into the information network (Vermesan, *et al.* 2009).

Thus, the Internet of Things could connect everything with everyone in an integrated global network (Rifkin, 2014).

This data will constantly feed larger data in order to be processed by means of an advanced analysis, transformed into predictive algorithms, and applied into automated systems so as to increase productivity, improve efficiency, reduce the marginal cost of producing and enhance the quality of life.

In the IoT, smart things will become active participants in business, information and social processes where they are enabled to interact and communicate among themselves and with the environment and people through the exchange of data and information sensed. These smart objects could also react autonomously to real world events and influence it by processes able to trigger actions and create services with or without direct human intervention.

The intelligent infrastructure requires three elements (Communications Internet, Energy Internet, and Logistics Internet), each of which interacts with the other to enable the system to operate as a whole. Communication is necessary to manage economic activity, energy is needed to generate information and transport, and logistics enabled us to move economic activity across the value chain.

These three Internets enable the others and work together in a single operating system, continuously finding ways to increase efficiencies and productivity of resources, the production and distribution of goods and services, and the recycling of waste.

The Energy Internet (IoE), the Logistic Internet (IoL), and the Communication Internet (IoC), are part of a single operating system: the Iot platform. They created a common global IT platform of seamless networks and networked “smart objects”.

The potential use of IoT technologies is discussed in various private and work domains, such as aviation, automotive, healthcare, safety, decisional process (Lombardi, *et al.*, 2015), transportation of people and goods, supply chain management and the private domain.

In this framework our paper aims to analyse, identify and highlight the main domain, application and issue related to the topic of Internet of things.

### **3 The research approach**

The research investigates into the topic of Internet of Things, analysing the existing literature. The research approach is based on the qualitative method (Maylor and Blackmon, 2005; Myers, 2013) and the sources of research are of a secondary nature.

The Internet of Things has been investigated through two database (Google Scholar and Ebsco) in which we have used four key words in order to provide a range of scientific contributes to fill out our literature review.

The applied key words are the following:

- Internet of Things;
- Energy Internet;
- Communication Internet;
- Logistic Internet.

The acquisition of data has been carried out according to the single-method approach and the retrieved contributions are classified in articles, books or chapters of books and white papers, and thesis.

In order to limit our research to much more recent contributions, we have chosen the time period ranging from 1995 to 2015, and for each keyword we have analysed the first six pages of resulting pages.

From the initial number of 480 results (240 results for Google Scholar and 240 for Ebsco) we considered 370 scientific prints related to the Internet of Things.

### **4 Finding and Discussion**

#### *4.1 Quantitative results*

The Internet of Things is a new paradigm that combines aspects and technologies deriving from different approaches.

The smart object able not only to collect information from the environment and interact with the physical world, but also to be interconnected, to each other, through Internet to exchange data and information. So these smart things could be considered as the building block of the IoT vision.

The interconnected devices and accessible data create new opportunities to define services, that will bring tangible benefits to the society, environment, economy and individual citizens.

All of these considerations bring out the importance of IoT in the knowledge-based economy. Therefore, the aim of the paper is to achieve an updated conceptualization of the Internet of Things by applying four keywords (Internet of Things, Energy Internet, Communication Internet and Logistic Internet) into the database: EBSCO and Google Scholar.

The following table 1 summarizes all of the results found in the databases for each keyword.

Table 1 – Databases Results

KEYWORDS	DATABASES	
	EBSCO	GOOGLE SCHOLAR
Internet of Things	4000	2.310.000
Energy Internet	386	3.910.000
Communication Internet	20165	3.490.000
Logistic Internet	302	449.000

Source: our elaboration

Based on the results obtained we decided to examine the first six pages of the results for each keyword, according to the period 1995-2015.

The following table 2 describes the data retrieved from the first database EBSCO.

Table 2- Ebsco

KEYWORDS	TOTAL	RELATED TO BUSINESS ADMINISTRATI ON	DUPLICATI ON	AVAILABL E		ANALYS ED
				TOTAL	RELATED TO MORE KEYWOR DS	
Internet of Things	60	57	0	9	0	73
Energy Internet	60	43	0	12	0	
Communication Internet	60	48	0	26	0	
Logistic Internet	60	36	0	26	0	
	<b>240</b>	<b>184</b>	<b>0</b>	<b>73</b>	<b>0</b>	

Source: our elaboration

On the database Ebsco we retrieved 184 scientific contributions related to business and administration, and 73 of them have been analysed .

The following table 3 reports the data concerning the second database Google Scholar.

Table 3- Google Scholar

KEYWORDS	TOTAL	RELATED TO BUSINESS ADMINISTRATION	DUPLICATION	AVAILABLE		ANALYSED
				TOTAL	RELATED TO MORE KEYWORDS	
Internet of Things	60	55	1	31	0	78
Energy Internet	60	48	1	36	0	
Communication Internet	60	37	0	8	0	
Logistic Internet	60	49	1	3	0	
	<b>240</b>	<b>189</b>	<b>3</b>	<b>78</b>	<b>0</b>	

Source: our elaboration

From the Google Scholar database, however, we retrieved 189 scientific contributions related to business and administration and 78 of them have been analysed .

Our analysis allowed us to retrieved 480 contributions, 373 related to business administration in the Internet of Things framework. The 373 scientific essays had 3 duplication, so we have retrieved 370 scientific contribution and we read and examined 152 of them.

Furthermore, from the date of publication (1995-2015) and the type of scientific product the following Table 4 has enabled us to analyze the scientific production on our topic (IoT) over time.

Table 4 – Quantitative results

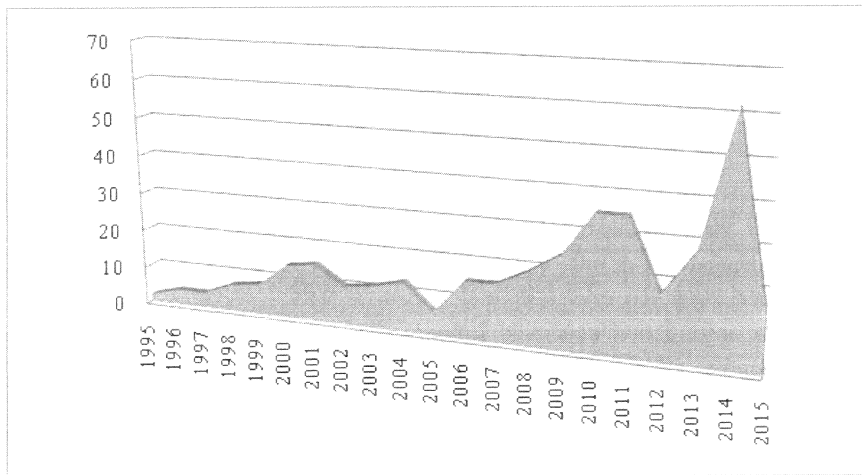
YEARS \ SCIENTIFIC PRODUCTS	ARTICLES	BOOKS	BOOK CHAPTERS	THESIS	WHITE PAPERS
2015	26	0	0	0	0
2014	61	1	0	0	0
2013	27	1	0	0	0
2012	16	1	0	0	0
2011	30	2	2	0	1
2010	29	6	0	0	0



2009	23	0	0	0	1
2008	14	5	0	0	0
2007	14	1	0	0	0
2006	14	1	0	0	0
2005	6	0	0	0	0
2004	12	0	1	0	0
2003	10	1	0	0	0
2002	8	1	0	1	0
2001	15	0	0	0	0
2000	12	2	0	0	0
1999	7	1	0	0	0
1998	7	0	0	0	0
1997	3	1	0	0	0
1996	2	2	0	0	0
1995	2	1	0	0	0

Source: our elaboration

The following figure 1 characterises the literature produced in the period analysed according to the research.



Source: our elaboration

Figure 1 – Literature development of the Internet of Things

#### 4.2 Qualitative Results

After classifying the scientific production on the basis of the quantitative aspect of results, they were classified on the basis of the topic investigated.

We observed that the scientific production on the IoT can be applied to a whole range of domains as follows:

- characteristics and tools;
- opportunities offered;
- regulation frameworks;
- issues;
- proposals of a model.

Some contributions described the IoT characteristics and tools (Chandrakanth *et al.*, 2014; Debasis, Jaydip, 2011, Gubbi, *et al.*, 2013; Sundmaeker, *et al.*, 2010; Sungmin, *et al.*, 2010)

Others scientific products defined the opportunities offered by the Internet of Things, such as:

- investment opportunity (Griffith, 2014);
- expansion of communication forms (Capriotti and Kuklinski, 2012; Kumar, *et al.*, 2015; Echterhoff, 2013);
- optimization of energy consumption (Aleksić, 2013; Cranwell *et al.*, 2014; Singh, Yiu, 2011);
- implication for marketing (Benady, 2014, Cristóbal-Fransi, *et al.*, 2014; Malhotra, 2000);
- implication for logistic and product delivery (Pye, 2014; Yu, *et al.*, 2015);
- source of innovation (Wright, *et al.*, 2003; Yuksekkaya, *et al.*, 2006);

Another aspect analysed is the legal framework of IoT. In particular, some authors (Weber and Weber, 2010) discuss the adoption of a self-regulatory approach to provide a legal framework for the Internet of Things, others (Trequattrini, *et al.* 2012b) prefer the definition of governmental rules.

Several authors analyse the issues related to IoT. They concern many features, such as privacy (Weber, 2010), security (Hamad, *et al.* 2009), ethical use (Roman, *et al.* 2011) of data, internet dependence or others psychological disease related to the use of this device from users (Rice, 2006; Ko, *et al.*, 2009).

Finally, the information generated from smart things has been used by authors to define and propose some models to solve the issues related to the IoT (Atzori, *et al.* 2011), and optimize energy management (Huang, *et al.*, 2010).

It is possible, under the previous assumption, to classify the retrieved scientific contributions by the main topics as follows in the table 5.

Table 5 – The qualitative results

<b>TOPICS</b>	<b>NUMBER OF CONTRIBUTION</b>
Characteristic and tool	85
Opportunity offered	187
Regualtion framework	10
Issue	48
Proposal of a model	40
	370

Source: our elaboration

The table highlights the main domain investigated is the opportunity offered by the Internet of Things vision.

## 5 Conclusion

The paper provides an updated conceptualization on the topic of Internet of Things, an Intelligent platform in which every node, business, home, vehicle, moment to moment, in real time, is linked via sensors and software.

This infrastructure is a global neutral network designed to be open, distributed, and collaborative, able to provide a wide flow of data, which could be applied to business purpose.

Over the years, the importance assumed by the IoT has led many authors to investigate into the topic. Therefore, in order to fully appreciate all the characteristics, the opportunities and the issues related to this intelligent infrastructure we made a qualitative and quantitative analysis of the data collected.

The following table 6 describes the quantitative analysis results.

Table 6- The quantitative analysis results

<b>PAPER</b>	<b>BOOKS</b>	<b>CHAPTERS OF BOOK</b>	<b>WHITE PAPER</b>	<b>THESIS</b>
91,3%	7,2%	0,8%	0,5%	0,2%

Source: our elaboration

In fact, the study shows that our subject is discussed mainly in papers, then books, chapters of book, white papers, and thesis.

However, on a qualitative level we find that the main topic investigated is the opportunity offered by the Internet of Things.

Therefore, our research highlights that the IoT is being introduced in several sectors, from industrial to commercial sectors .

Companies have applied sensors to track the flow of goods and services. Logistic companies embed sensors in their vehicles to monitor potential malfunctions so they can replace them before a costly breakdown occurs.

The IoT could be used also to create smart cities. Sensors could be placed along street to optimize driving and walking routes, monitor streets traffic congestion, and pedestrian density or inform of the availability of parking spaces, or keep drivers up to date on accidents and traffic delays.

Also, to predict risk, and determine insurance, the insurance companies are beginning to place sensors in vehicles.

The Internet of Things is being applied in the natural environment to better defend the Earth's ecosystems. Sensors are being installed across cities, suburbs, and rural communities, in soil, in rivers, lakes, and oceans, and in wild animals and along migratory trails.

The use of sensors to monitor weather conditions, changes in moisture, the spread of pollen, and other factors that affect yields are transforming the method of food production.

IoT is also applied in the field of medicine by attaching or implanting sensors inside human bodies to monitor bodily functions including heart rate, pulse, or body temperature to notify doctors of vital changes that might require attention.

Finally, another application is in security systems and home control.

However, the IoT also raises issues regarding data security, personal privacy, and health and psychological disease, thus these features highlighted the importance of education to an ethical use of the IoT framework and the data collected.

This Intelligent infrastructure, as part of Third Industrial Revolution (Rifkin, 2015), integrates the virtual environment and the natural environment in a operating network, creating synergies and facilitating interconnections and avoids business crisis (Trequattrini, *et al.* 2012c).

In this way we can optimize the use of efficiency and productivity of resources, formation and growth of new industries, new organizational models aimed at the dissemination of information, the production and distribution of goods and services, and the recycling of waste while ensuring the well-being of the Earth as a whole.

The paper has some limitations, we have only considered the literature produced between 1995 and 2015 and only the first six pages of two databases (EBSCO and Google Scholar).

Therefore, a future analysis may be carried out in order to analyse a greater time period and by applying the key words in more databases.

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## DICHIARAZIONE SOSTITUTIVA DI CERTIFICAZIONE

(Art. 46 D.P.R. n. 445 del 28 dicembre 2000)

I sottoscritti

- Bruno Marsigalia, nato a Pistoia (PI) il 30.05.1972 e residente in Roma (RM), Via Rubra 58, (documento di identità: carta di identità n. AV 5972122);
- Federica Evangelista, nata a Cassino (FR) il 10.05.1987 e residente a Cassino (FR) in Via S. Angelo 166, (documento di identità: carta d'identità n. AR8242389);
- Matteo Palmaccio, nato a Formia (LT) il 06.06.1990 e residente in Formia (LT) Via Solaro, 27 (documento di identità: carta d'identità n. AR 2978597);
- Giuseppe Russo nato a Belleville (USA) il 24.03.1968 e residente in Cassino (FR), Via Tommaso Campanella (documento di identità: patente n. U17000193N).

sotto la loro personale responsabilità ed a piena conoscenza della responsabilità penale prevista per le dichiarazioni false dall'art. 76 del D.P.R. 445/2000 e dalle disposizioni del Codice Penale e dalle leggi speciali in materia

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di essere autori del paper scientifico dal titolo "*The Internet of Things: emerging profiles*", pubblicato nel conference readings book proceedings della IFAD Conference 2015, 10th International Forum on Knowledge Asset Dynamics, Culture, Innovation and Entrepreneurship: connecting the knowledge dots, 10-12 June 2015, Bari, Italy (ISBN 1463-7154) con rispettiva assegnazione dei seguenti paragrafi:

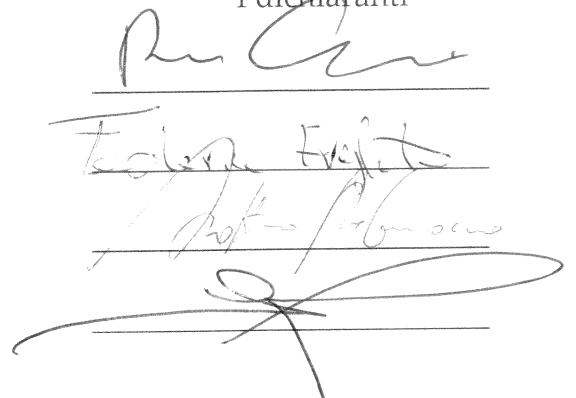
1. i paragrafi Introduction e The research approach sono stati sviluppati da Bruno Marsigalia;
2. i paragrafi Literature Review e Qualitative Results sono stati sviluppati da Federica Evangelista;
3. il paragrafo Quantitative results è stato sviluppato da Matteo Palmaccio;
4. il paragrafo Conclusion è stato sviluppato da Giuseppe Russo.

Dichiarano, altresì, di essere informati, ai sensi e per gli effetti di cui all'art. 10 della legge 675/96, che i dati personali raccolti saranno trattati, anche con strumenti informatici, esclusivamente nell'ambito del procedimento per il quale la presente dichiarazione viene resa.

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I dichiaranti



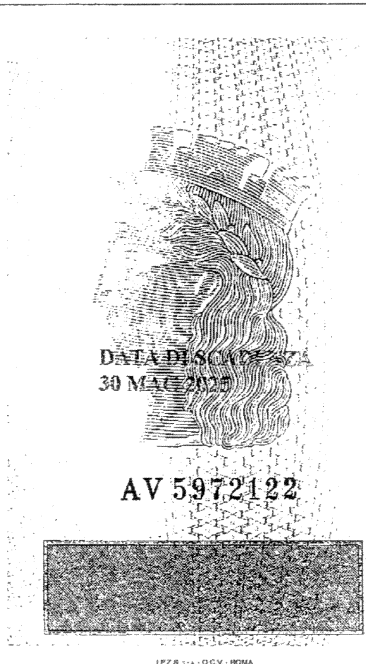
The image shows three handwritten signatures in black ink, each followed by a horizontal line. The signatures are: 1. Bruno Marsigalia, 2. Federica Evangelista, and 3. Giuseppe Russo. The signatures are written in a cursive style.



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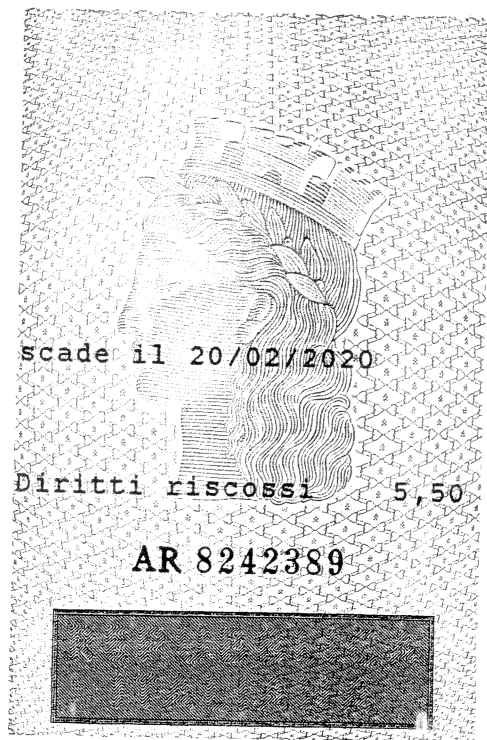
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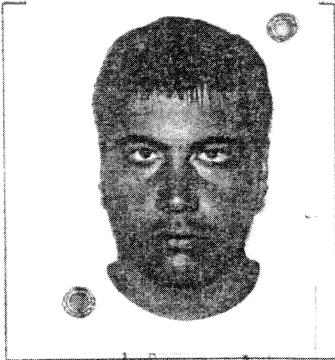
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