Carlos E. Pereira – Prof. Dr.-Ing.
Director of Operations
cpereira@embrapii.org.br
Full Professor – School of Engineering UFRGS

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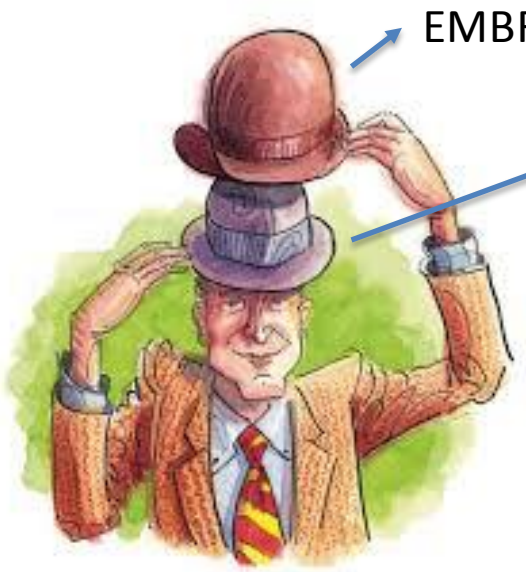
Empresa Brasileira de Pesquisa
e Inovação Industrial

Brainstorming sessions:
Making the challenges pertinent to Brazil

- Principais desafios do Brasil para a engenharia brasileira vs. Mundial no contexto Grand Challenges of Engineering/ODSse.
- Exemplos de sucesso, e estratégias, para o contexto atual implementação.



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EMBRAPII

- Network of research centers/technological research laboratories: EMBRAPII Unities;
- Focus on strategic areas for innovation with clearer potential of technological, economical, and social impact;
- Main goals:
  - Support Brazilian companies in developing high-skill, strategic products and technologies that can enhance their competitiveness in national and international markets
  - Mitigate the risk of investing in innovation
  - Foster interaction of private companies and Institutes of Science and Technology
  - Focus on industrial needs
  - Fast and flexible model of operation
  - Funding for applied research projects (TRL 3 to 6)

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42 EMBRAPII UNITS

Unidade
IF-BA
SENAI - CIMATEC

Unidade
CESAR

Unidade
IF-CE

Unidade
IF-PB
CEEI - UFCG

Unidade
CSEM
IF-Sul de Minas
DCC – UFMG
IF –MG
FEMEC
INATEL
ISI-MLE

Unidade
INDT

Unidade
Embrapa

Unidade
IF-Goiano

Unidade
ISI-Biomassa

Unidade
LACTEC
ISI – Eletroquímica

Unidade
SENAI – Polímeros
UFRGS - LAMEF
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Unidade
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CERTI
SENAI - Joinville
POLO - UFSC
ISI – Sistemas Embarcados

Unidade
IF-ES

Unidade
COPPE
IF-Fluminense
INT
Tecgraf

Unidade
Tecnogreen
CNPEM
CPqD
Eldorado
ESALQ
CQMED
IPT
IPT-BIO
POLI – USP
IFSC-USP

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EMBRAPII as a partner to address the Engineering Grand Challenges in Brazil

- Several units deal with topics related to the Grand Challenges and have ongoing projects that address the challenges, in cooperation with industry

765 Contracted Projects

542 Companies

R$ 1.3 BILLION accumulated invested amount

EMBRAPII Participation	Companies Participation	EMBRAPII's Units Participation
33% Last risk for companies	49% More private money	18%

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Competence areas

AMAZONAS
- Advanced Manufacturing

BAHIA
- Integrated Manufacturing
- Medical devices

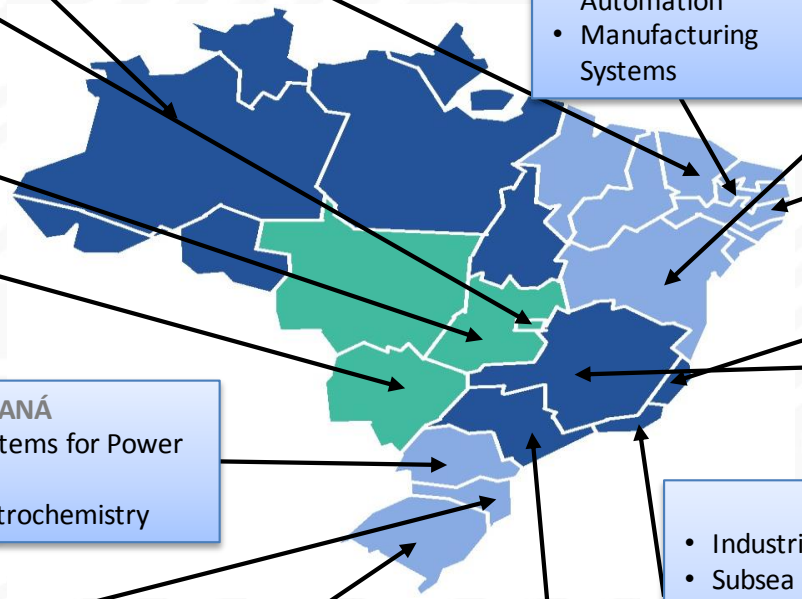
CEARÁ
- Embedded and mobile systems

DISTRITO FEDERAL
- Biochemistry – Renewable products

PARAÍBA
- Software and Automation
- Manufacturing Systems

PERNAMBUCO
- Connected products

GOIÁS
- Agroindustrial Technologies



MATO GROSSO DO SUL
- Biomass Transformation

ESPÍRITO SANTO
- Metallurgy and Materials

MINAS GERAIS
- Metal-Mechanics technologies
- Digital and RF communication
- Printed electronics and organic solar cells
- Smart automotive systems
- Cyber-Physical systems
- Technologies for Coffee industry
- Advanced materials

PARANÁ
- Embedded Systems for Power electronics
- Industrial Electrochemistry

RIO DE JANEIRO
- Industrial Chemistry technologies
- Subsea engineering
- Environmental monitoring and instrumentation
- Computational solutions for engineering

SANTA CATARINA
- Laser Manufacturing
- Advanced cooling technologies
- Energy systems, Embedded Systems
- Smart systems development
- Embedded Systems

RIO GRANDE DO SUL
- Polymers
- Duct technologies
- Sensing Systems

SÃO PAULO
- Bio-Pharmaceuticals
- Biological pest control
- Bio-photonics and instrumentation
- Scale-up of bio-processes
- Biomass processing
- Eco-efficient materials for construction
- Green Chemistry
- High performance materials
- Optical communication
- Internet based devices

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EMBRAPII as a partner to address the Engineering Grand Challenges in Brazil

- Several units deal with topics related to the Grand Challenges and have ongoing projects that address the challenges, in cooperation with industry
- Involvement of undergrad and grad students in projects as a mandatory requirement for the “Institutos Federais” and soon for the “Universidades Federais” within the EMBRAPII agreement with Ministry of Education (aligned with GCSP)

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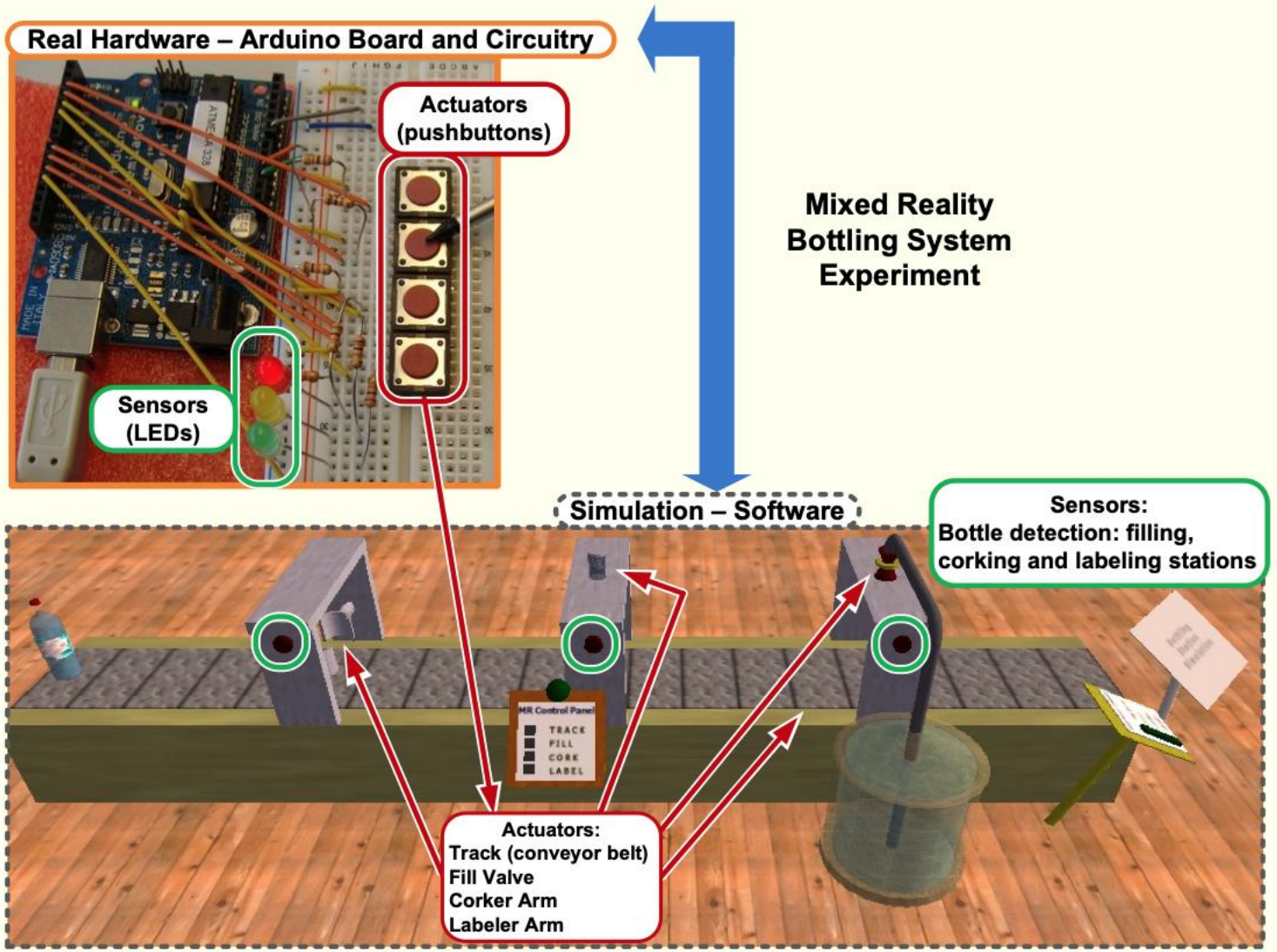
Virtual Bottling Plant + Arduino



g Environment

Advance Personalized Learning

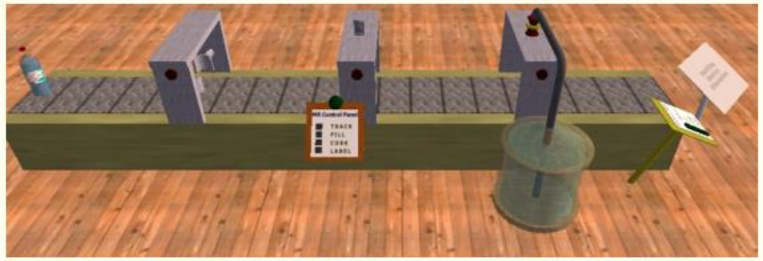
Enhance Virtual Reality

VLE+MixedReality+ StudentFeedback

Interchangeable Components in 3D AutoSysLab

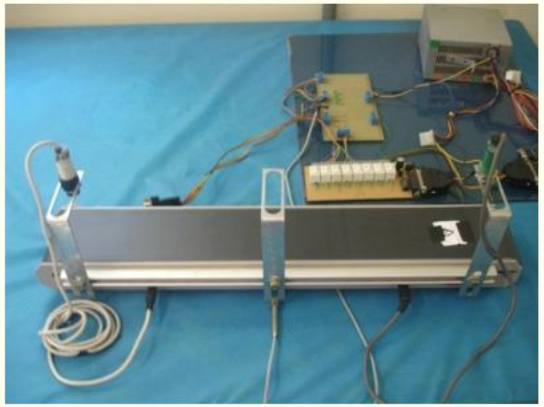
Simulated controller

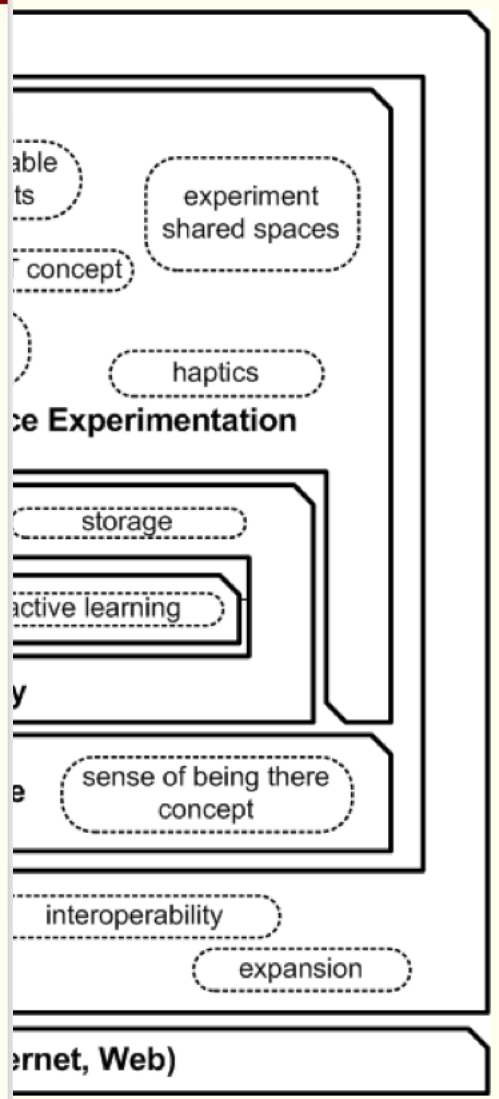
Virtual Bottling Plant



Micro Webserver or Arduino

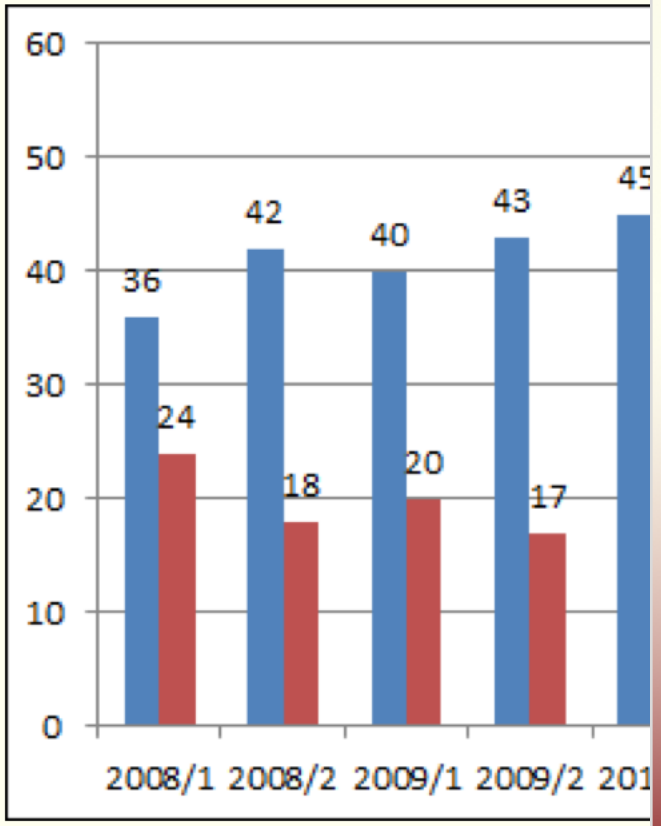
Augmented Reality Bottling Plant





7. Case studies results

- Control II – Students' performa



Conclusions

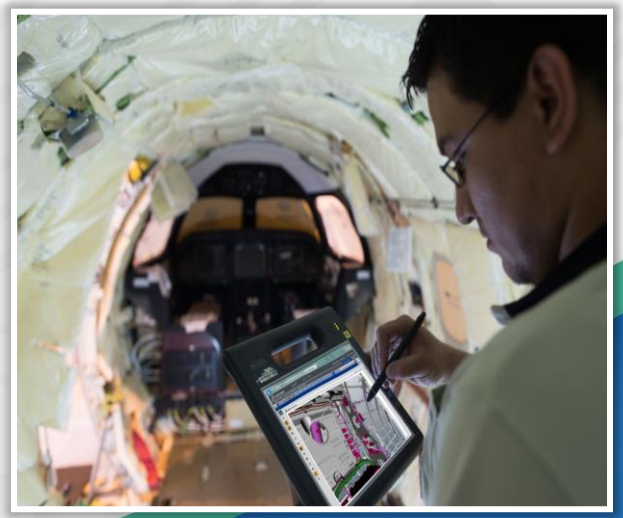
"As we think about the many challenges ahead, it is important to remember that students are driven by passion, curiosity, engagement, and dreams. … In the long run, making universities and engineering schools exciting, creative, adventurous, rigorous, demanding, and empowering milieus is more important than specifying curricular details."

Charles M.Vest, Grand Challenges for Engineering

"Educating Engineers for 2020 and Beyond"

Educating the Engineer of 2020

Digital Twin



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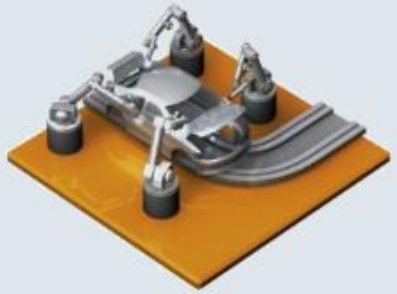
Digital Twin

Motivation

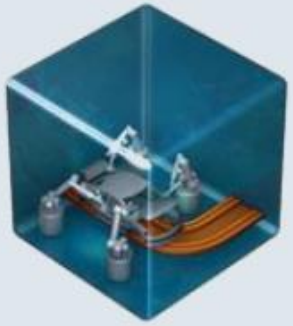
SIEMENS

Physical product



Physical production facility

+



Digital model

Contains all the information on …

- Software / Informatics
- Mechanics
- Electrics, Electronics
- Automation, HMI
- Safety, security
- Maintenance

- Location, identity…
- Status
- SW version
- Interfaces
- …

The digital twin is always up-to-date and is extended over the entire lifecycle

Production Design	Production Planning	Production Engineering	Production Execution	Production Services
Product Design	Product Engineering	Product Production	Product Operation	Product Maintenance

*Note: feedback and feedforward loops not visualized

References - GCAR/UFRGS Collaborative Learning

- •SCHAF, Frederico Menine ; Paladini, Suenoni ; Pereira, Carlos Eduardo . 3D AutoSysLab Prototype - A Social, Immersive and Mixed Reality Approach for Collaborative Learning Environments. International Journal of Engineering Pedagogy (iJEP), v. 2, p. 15-22, 2012.
- •SCHAF, F M ; PEREIRA, C. E . Integrating Mixed Reality Remote Experiments into Virtual Learning Enviroments using Interchangeable Components. IEEE Transactions on Industrial Electronics (1982. Print), v. 56, p. 4776-4783, 2009.
- •SCHAF, F M ; MULLER, Dieter ; BRUNS, F. W. ; PEREIRA, C. E ; ERBE, Heinz H . Collaborative Learning and Engineering Workspaces. Annual Reviews in Control, v. 33, p. 246-252, 2009.
- •PEREIRA, C. E; Paladini, S. ; SCHAF, Frederico Menine . Control and Automation Engineering Education: Combining Physical, Remote and Virtual Labs. In: 9th International Multi-Conference on Systems, Signals and Devices - SSD'12, 2012, Chemnitz. p. 1-10.98.
- •SCHAF, Frederico Menine ; Paladini, S. ; PEREIRA, C.E. . 3D AutoSysLab Prototype A Social, Immersive and Mixed Reality Approach for Collaborative Learning Environments. In: IEEE International Conference EDUCON, 2012, Marrakesh. Proceedings of the IEEE International Conference EDUCON'12, 2012. p. 1161-1169.

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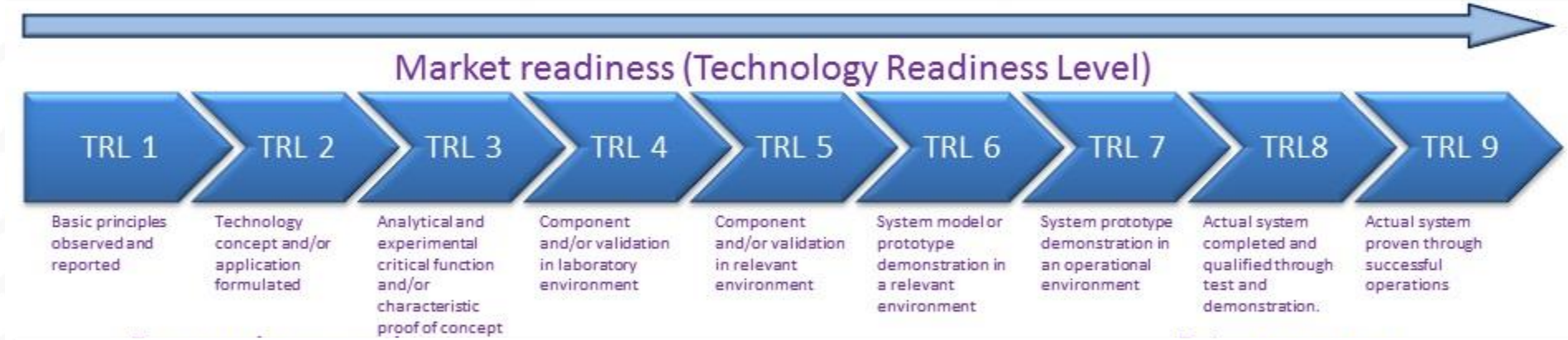
EMBRAPII projects: covered TRLs



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We help companies to overcome the “Valley of Death"

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“Inspiration models”

Country	Organization	# Units
Germany	Fraunhofer	67
Danmark	GTS – Advanced Technology Group	9
USA	Innovation Institutes	7 (45 planned)
Finnland	TE Centres	15
France	Carnot Institutes	34
Sweden	RISE	16
UK	Catapult	17
Austria	COMET Centers	5 K1 and 17 K2 centers

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Funding model

EMBRAPII anticipates **resources** so that its Unit may quickly contract projects with the industrial sector

Agility, flexibility and speed in use of resources and changes in project scope

NO BUREAUCRACY

- **The research project is defined directly between the industrial partner and the EMBRAPII Unity**

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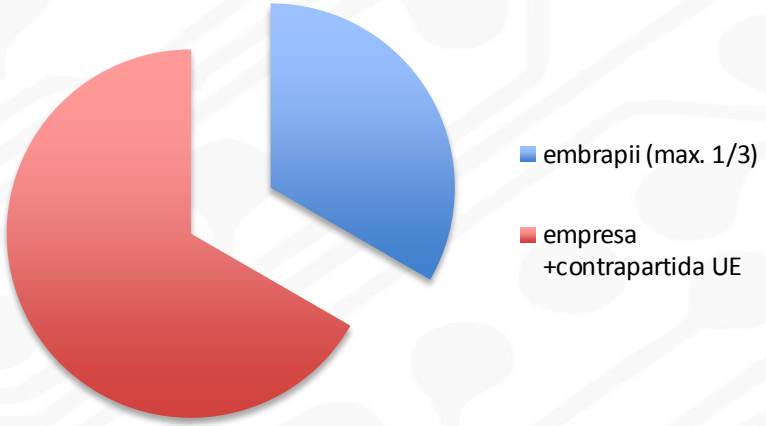
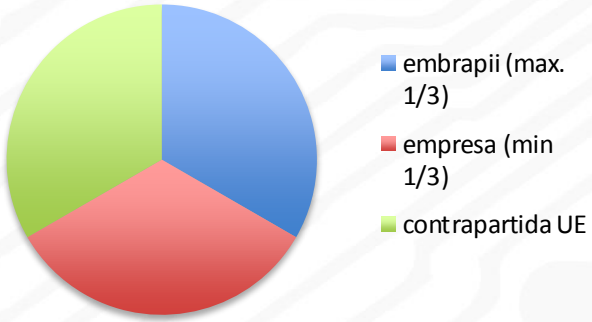
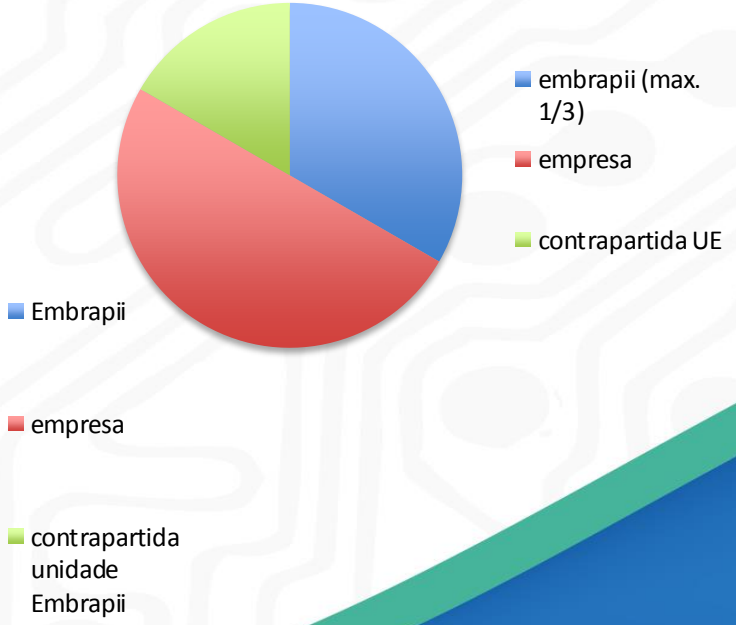
Resource composition

- Up to 1/3 of project costs covered by EMBRAPII
- At least 1/3 of funding coming from industry (financial contribution)
- EMBRAPII unit can also contribute (in kind)







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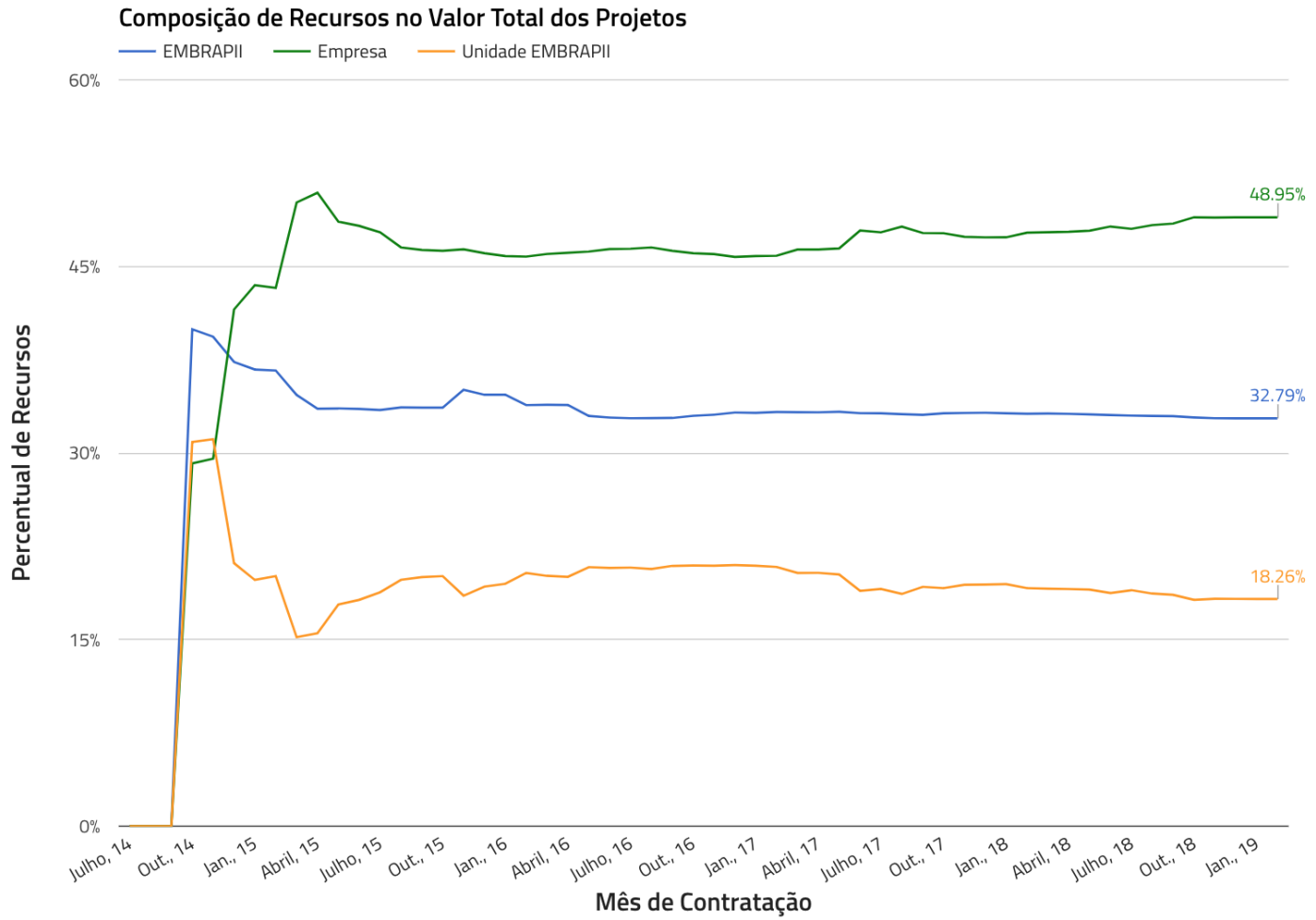
EMBRAPII´s funding by source



Fonte: SRINFO v2 / EMBRAPII. Extraído em 05/02/2019

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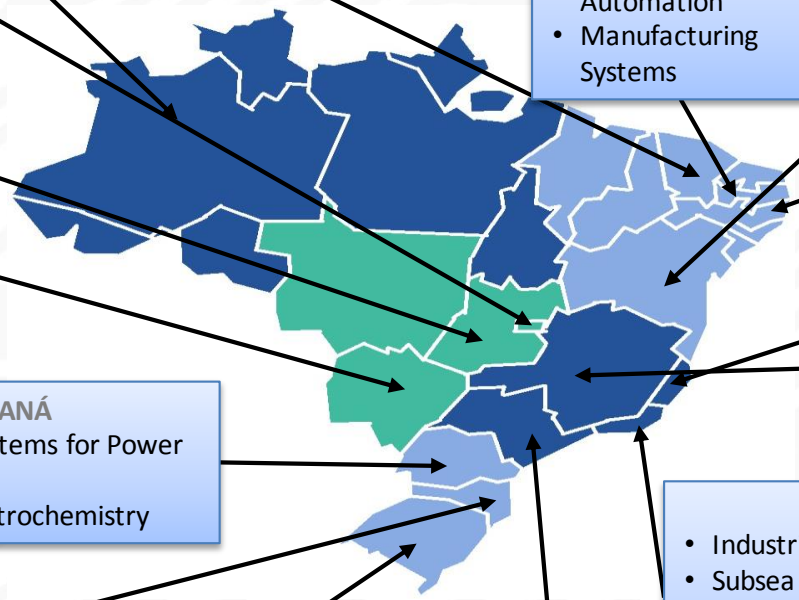
Competence areas



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- Medical devices

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- Embedded and mobile systems

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- Internet based devices

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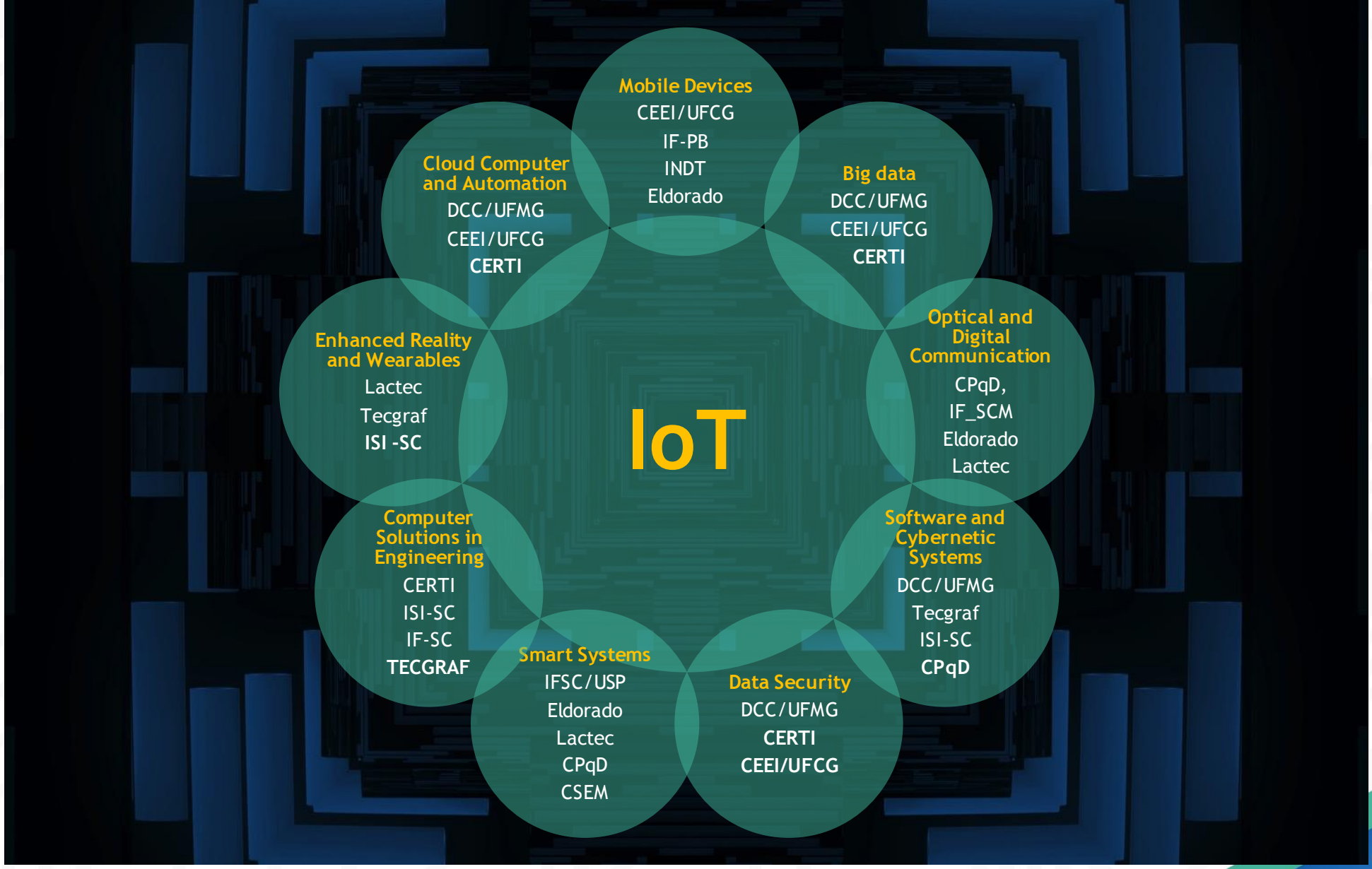

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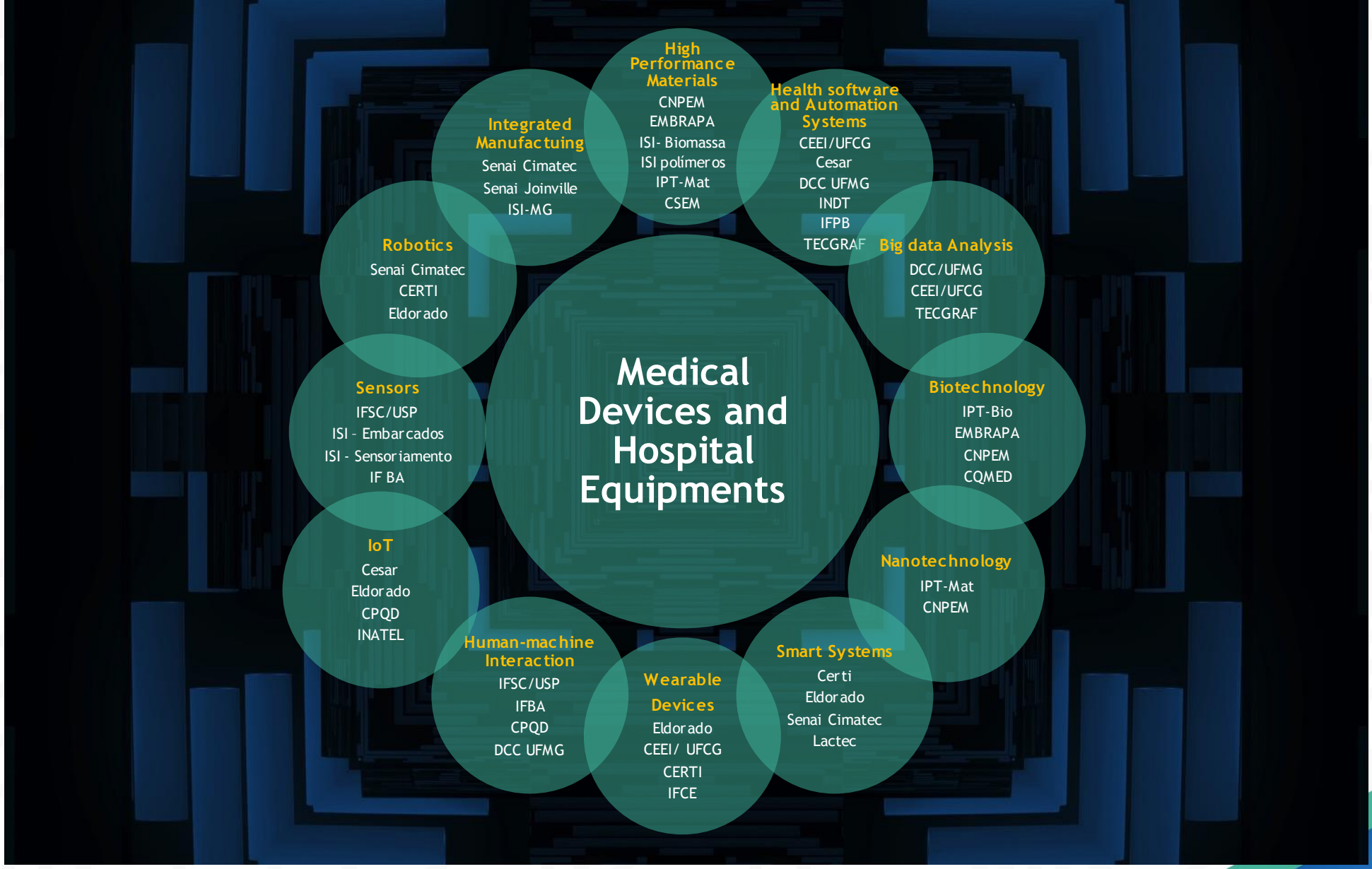

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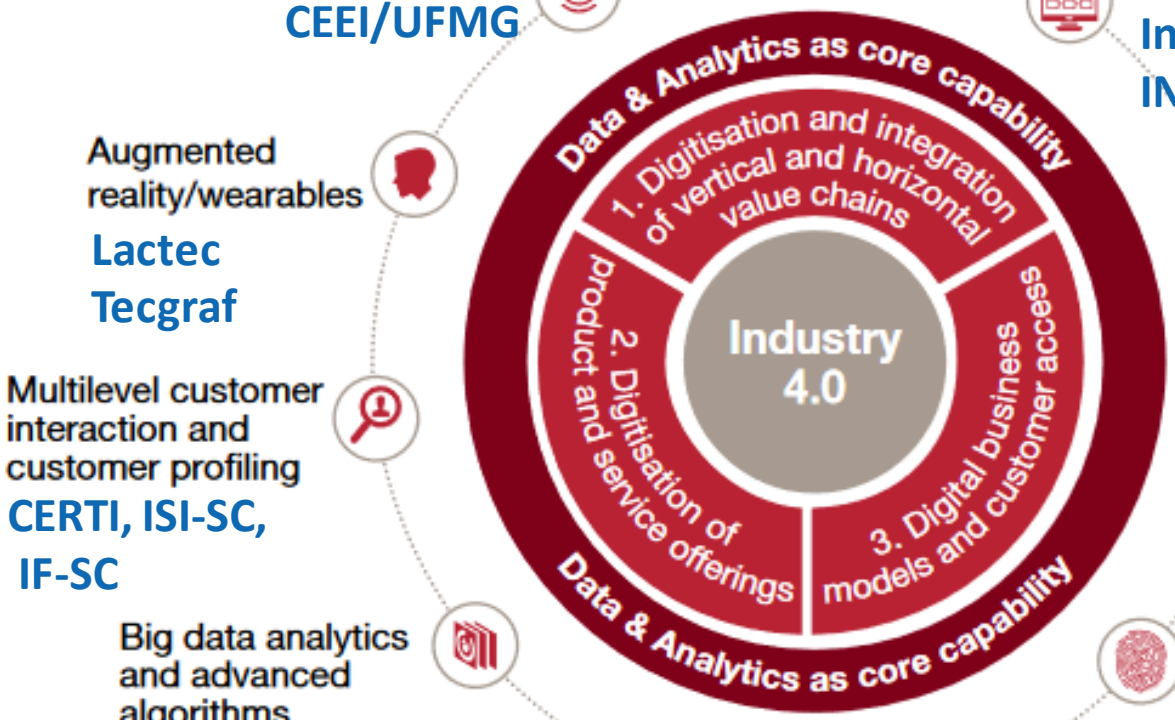
Industry 4.0 framework and contributing digital technologies



Mobile devices
CEEI/UFCG , IF-PB
INDT, ELDORADO

Cloud computing
DCC/ UFMG
CEEI/UFMG

IoT platforms
C.E.S.A.R.
Inatel
INDT

Augmented reality/wearables
Lactec
Tecgraf

Location detection technologies
CPqD. IF-SCM
Eldorado, LACTEC

Multilevel customer interaction and customer profiling
CERTI, ISI-SC,
IF-SC

Advanced human-machine interfaces
DCC/UFMG
Tecgraf, ISI-SC

Big data analytics and advanced algorithms
DCC/UFMG
CEEI/UFCG

Authentication & fraud detection
DCC/UFMG

Smart sensors
Lactec IFSC/USP
CPqD Eldorado
CSEM

3D printing
Senai Cimatec
Senai Joinvile

EMBRAPII
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INDUSTRIAL PARTNERS

INDUSTRIAL PARTNERS

INDUSTRIAL PARTNERS

EMBRAPII
Empresa Brasileira de Pesquisa e Inovação Industrial

International Cooperation Partnerships

MINISTÉRIO DA INDÚSTRIA, COMÉRCIO EXTERIOR E SERVIÇOS

BRASIL GOVERNO FEDERAL

BNDES o banco nacional do desenvolvimento

EUREKA innovation across borders

Federal Ministry for Economic Affairs and Energy

Fraunhofer

cornet

Innovate UK

Newton Fund

COOPERAÇÃO TECNOLÓGICA BRASIL | ISRAEL

VINNOVA

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SUMMARY - EMBRAPII Project's Requirements

- Must address an industrial demand (1 or more industrial partners involved)
- TRL 3 to 6
- Developed/Managed by EMBRAPII unit
- EMBRAPII funding model (up to 1/3 EMBRAPII, at least 1/3 from companies)

EMBRAPII
Empresa Brasileira de Pesquisa e Inovação Industrial

- VERY FLEXIBLE MODEL, DIFFERENT PROJECT CONFIGURATIONS ARE ALLOWED:

  - OPEN INNOVATION
    (EX: CQMED – STRUCTURAL GENOMICS CONSORTIUM)

  - COOPERATION LARGE + STARTUPS/SMEs
    (EX: SEBRAE COOPERATION)

  - COOPERATIVE PROJECTS
    (EX: NATURA/BOTICARIO/YAMA/THERASKIN)

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EMBRAPII
Empresa Brasileira de Pesquisa e Inovação Industrial

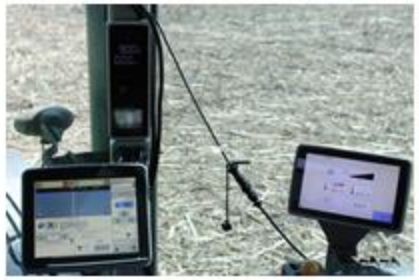
EMBRAPII UNIT: IF GOIANO

INSTITUTO FEDERAL Goiano

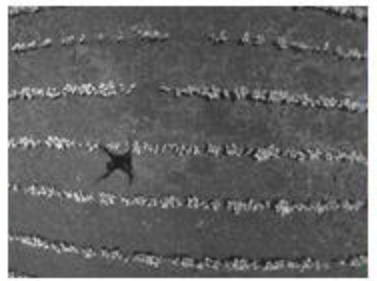
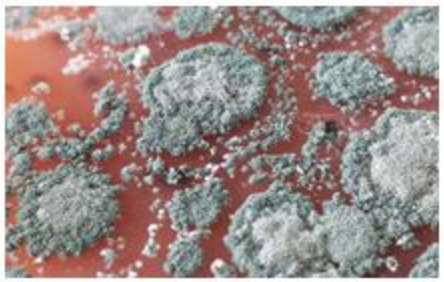
UNIDADE EMBRAPII TECNOLOGIAS AGROINDUSTRIAIS

Agroindustrial Technologies

- Technologies for agriculture management
- Postharvest technologies





EMBRAPII UNIT: IF GOIANO

INSTITUTO FEDERAL Goiano

UNIDADE EMBRAPII TECNOLOGIAS AGROINDUSTRIAIS

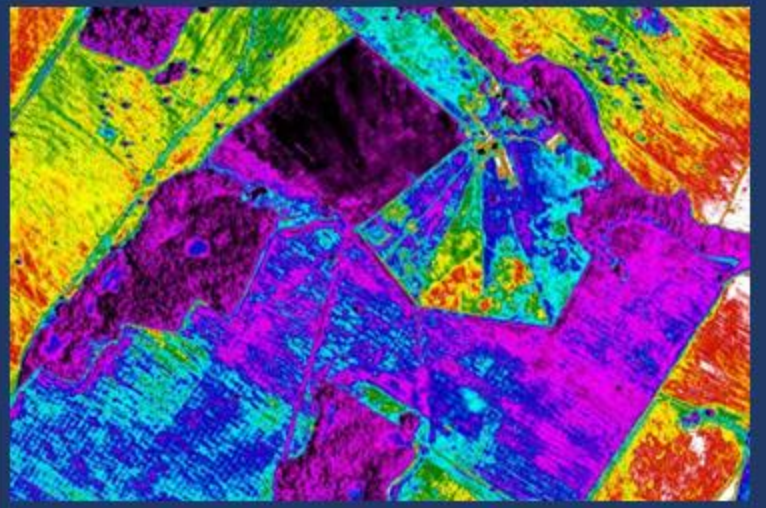
EXPERTISE

- Seeds technologies
- Grains drying and storage
- Biological control
- Plant Pathology and Nematology
- Agricultural Entomology and pesticide toxicology
- Weed Science
- Pesticide application technologies
- Plant breeding
- Irrigation automation technologies
- Data Acquisition and modeling
- Digital image processing and algorithms prototyping
- Remoto sensing for precision farming
- Integrated crop-livestock-forest systems

Customized sensor + A.I. for nematode management on soybean

The project is developing an algorithm and a customized sensor to identify areas under attack of a specie of nematode. The solution has also a database and A.I. to recommend management.

The technology may reduce costs of production and improve the information management in farms.



Total investment
R$ 1.500.000 / € 340.000

Thank you

www.embrapii.org.br

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