FROM LONELY DISCOVERY TO CROWDSOURCING. WHAT IS NEXT?

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Song Von Park – USP

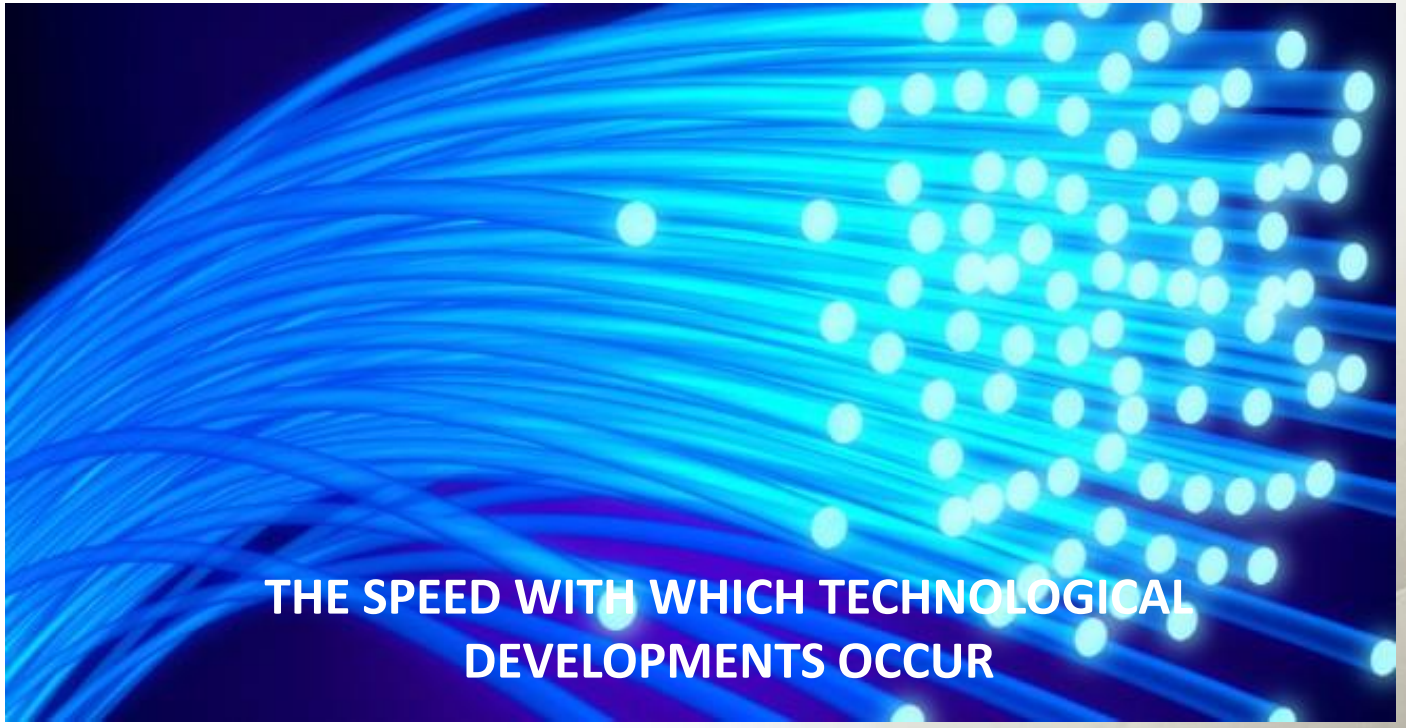
São Paulo, October 24th, 2018.

CORREALIZAÇÃO

REALIZAÇÃO

WHAT BEST CHARACTERIZES NOWADAYS?

https://www.google.com.br/search?q=imagens



GREAT CHANGES OCCURED IN THE LAST TWO CENTURIES

AROUND 1850 IN THE OCIDENTAL WORLD

Source: *A lively look at paper making* (century XVIII). Paper Conservator, 1998.

Source: *A lively look at paper making* (century XVIII). Paper Conservator, 1998.

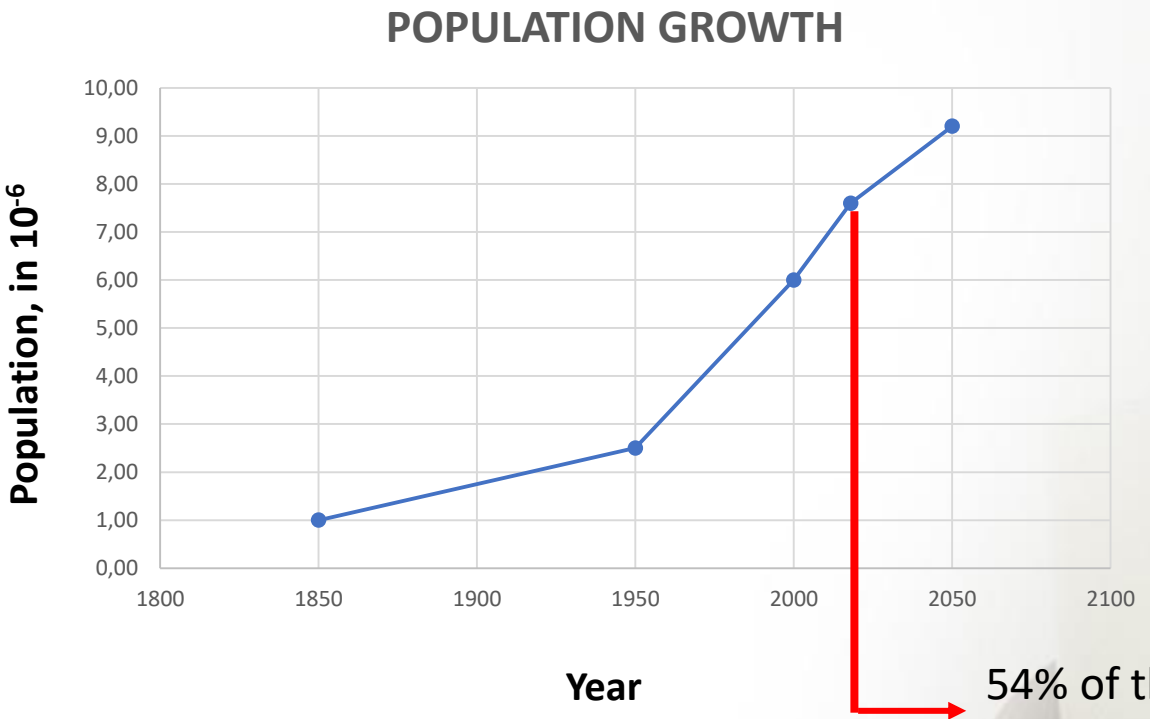
1893	The largest paper machine in the world (Star mill, England) produced paper 55 cm wide. The machine was able to produce 10t/ day.

Source: Dard Hunter. Papermaking: The history and technique of an ancient craft, Dover publication, 1974

2013	The largest paper machine in the world (Hainan Jinhai Pulp & Paper Co., Hainan, China) produces paper 1180 cm wide. It is able to produce 4537t/day. Maximum operating speed: 1700m/min.

Source: 31/ 2010 / Voith Paper / twogether – page 16-19

Same technical principles
P&D&I



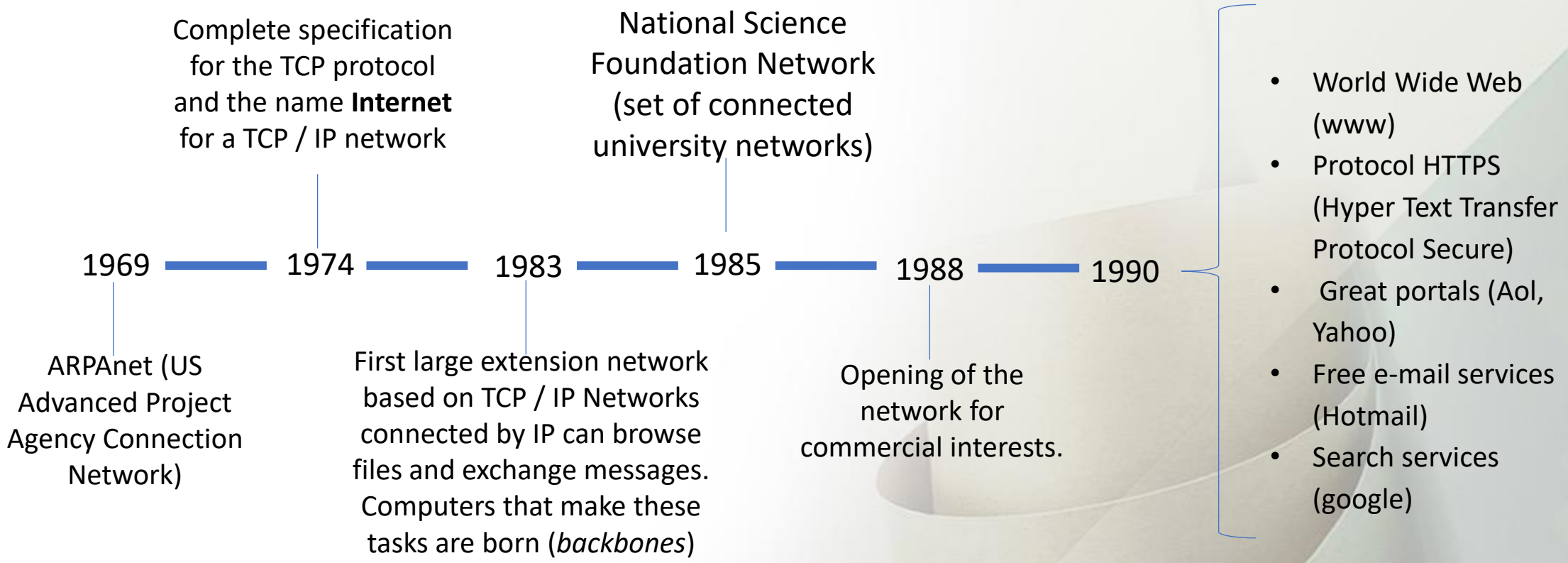
54% of the population lives in urban areas.

https://www.unric.org/pt/actualidade/31537-relatorio-da-onu-mostra-populacao-mundial-cada-vez-mais-urbanizada-mais-de-metade-vive-em-zonas-urbanizadas-ao-que-se-podem-juntar-25-mil-milhoes-em-2050

https://news.un.org/pt/story/2017/06/1589091-populacao-mundial-atingiu-76-bilhoes-de-habitantes

https://mundoeducacao.bol.uol.com.br/geografia/crescimento-populacao-mundial.htm

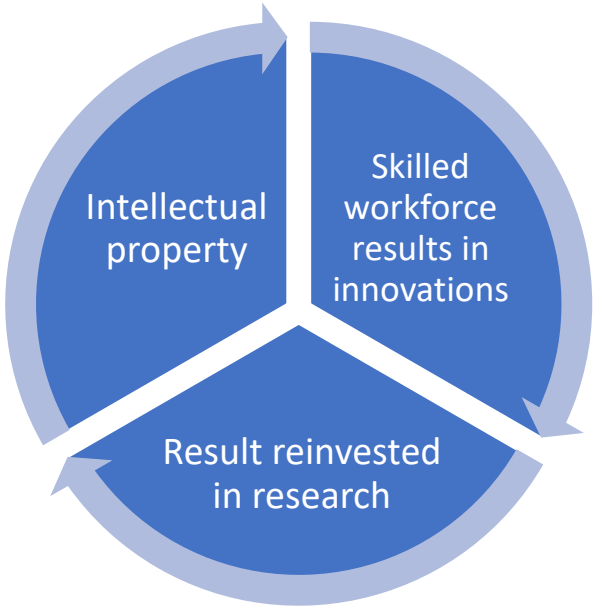
Creation and Evolution of the Internet → e-Science



https://www.techtudo.com.br/artigos/noticia/2013/04/internet-completa-44-anos-relembre-historia-da-web.html
http://www.din.uem.br/~tait/evolucao-internet.pdf

WHAT ABOUT INNOVATION?

CLOSED MODEL FOR INNOVATION



Intellectual property is the engine of the cycle

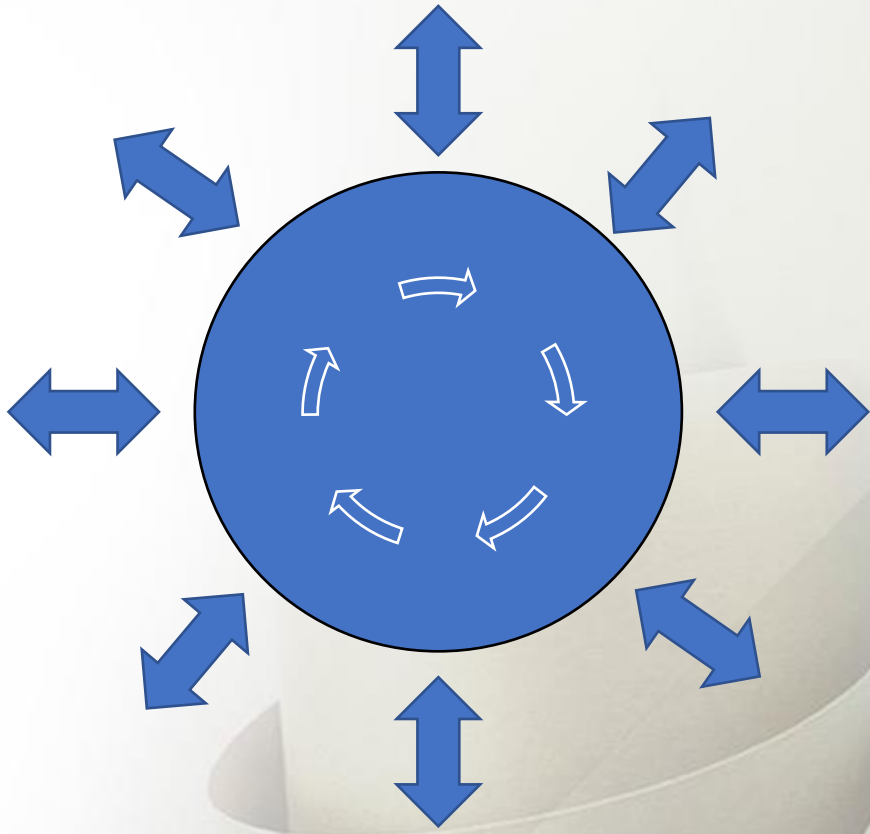
DIFFICULTIES:

- **Solving more complex issues, which requires specific and multi-disciplinary knowledges.**
- **Adapting to a market with skilled labor mobility**
- **Keeping up with the pace of demand for innovation.**

  - reduction of the life of products

  - competitiveness increasingly dependent on innovations

OPEN MODEL FOR INNOVATION



COMPANIES CAN AND SHOULD USE INTERNAL AND EXTERNAL KNOWLEDGE FOR RESEARCH AND INNOVATIONS.

CROWDSOURCING

External sources of knowledge as a central process for research / innovation

Use of collective intelligence from experts and communities to solve problems.

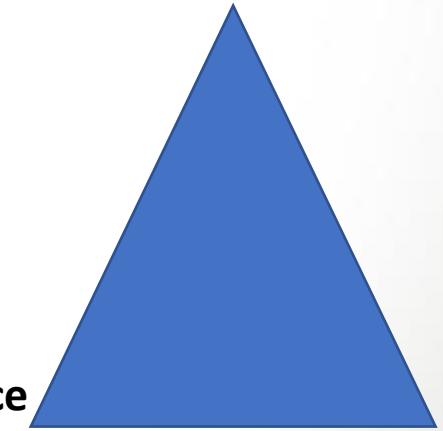
SOME TYPES OF CROWDSOURCING

CROWD CASTING	A problem is disclosed to a wide network of potential solvers in search of a solution
CROWD CREATIVITY	The goal is to obtain contributions in the development of products or concepts (as mark, logos, etc.)
CROWD COMPETITION	The goal is to solve complex problems that require specialized knowledge, usually in science and technology. A prize is offered to the person that comes up with the best solution
CROWD COLLABORATION	The goal is to solve a complex problem combining the ideas of the participant, that should have different degrees of specificity.
CROWD TUNING	Usually the goal is to verify and to validate computational tools.

BRANQUINHO, Carmen Lucia. Crowdsourcing: uma forma de inovação aberta. Rio de Janeiro: CETEM/MCTI, fev./2016. 194 p.

WHAT IS NECESSARY FOR CROWDSOURCING?

A demand from an organization



Collective intelligence from experts or communities to attend the demand

Platform that enables the application of crowdsourcing

kaggle

https://www.kaggle.com/

INNOCENTIVE

https://www.innocentive.com/

WHAT ABOUT UNIVERSITIES?

Universities and Technological Research Institutes

CONNECTIVITY

- **Collaborative work**
- **E-Science**

ENTREPRENEURSHIP

- Transform basic research into products and services to advance human progress (Academic Entrepreneurs)
- Spun out technology from academic laboratories (Start ups)

Academic entrepreneur

- Break the barrier between basic and applied science
- Transfer technology

Characteristics

- **Ability to take risks (but not excessive risks)**
- **Innovative**
- **Knowledge on how the market functions**
- **Manufacturing know-how**
- **Marketing skills**
- **Business management skills**
- **Ability to cooperate**
- **Good nose for business**
- **Ability to correct errors effectively**
- **Ability to grasp profitable opportunities**

2017 BOOK Michele Marcolongo - Academic Entrepreneurship_ How to Bring Your Scientific Discovery to a Successful Commercial Product

START UPS

A PERFECT COMBINATION BETWEEN SCIENTISTS AND STUDENTS

"Academically trained scientists and engineers excel at discovery. Faculty, postdocs, and students have certain skills that enable them to identify potential commercial opportunity"

2017 BOOK Michele Marcolongo - Academic Entrepreneurship_ How to Bring Your Scientific Discovery to a Successful Commercial Product

ENTREPRENEURSHIP
Challenges for the Universities

Considering technology transfer

Never forget that Basic Sience feeds Applied Science

Have in mind that a good researchers are not necessarily an entrepreuner and that a good entrepreuner is not necessarily a great researcher.

Drivers are needed to encourage and support academic entrepreunership.

Well-developed academic networks are diffenrent from a well-developed networks in the entrepreneurial community.

New models of courses should be created to contemplate academic entrepreunership.

CONNECTIVITY
Challenges for the Universities

- **Researchers need to be connected**
- **Computing platform as the base for an e-Science community**

To bring researchers together for collaborative work in key areas of the Science.

To have a comprehensive cybernetic system and respect it (data grid, computing grid, collaboratives grid).

To choose the decentralized architecture able to incorporate specific mechanisms and interfaces to engage all the elements necessary to fulfill the needs for the R&D, to improve the ability to construct road map and solve problems and to support a useful class of applications.

To apply e-science infrastructure with the necessary interoperability to maintain the three pillars of science: theory models, experiments in laboratories, and computational techniques (simulation and data analysis).

Reduce information maintaining meaning and extract patterns from massive and growing data resources.

Scientific publications in the base Scopus and WoS, 2006-2015

Ano	Total	Free access
2006	980 477	395 927
2007	1 050 083	443 927
2008	1 129 441	499 992
2009	1 183 706	539 306
2010	1 226 929	574 191
2011	1 308 110	616 958
2012	1 375 335	644 512
2013	1 451 327	676 835
2014	1 490 237	680 981
2015	1 455 361	502 158

Support for Bibliometrics Indicators: Open access availability of scientific publications. Science-Metrix Inc- Analytical (Jan. 2018)

- **Cloud computing and distributed digital information leads to a flow of data and information**
- **It is essential to make data and information useful in the short term and extend their life and usefulness in the long term.**
- **It is essential to know how to deal with the new way of creating, saving, retrieving and sharing datas.**

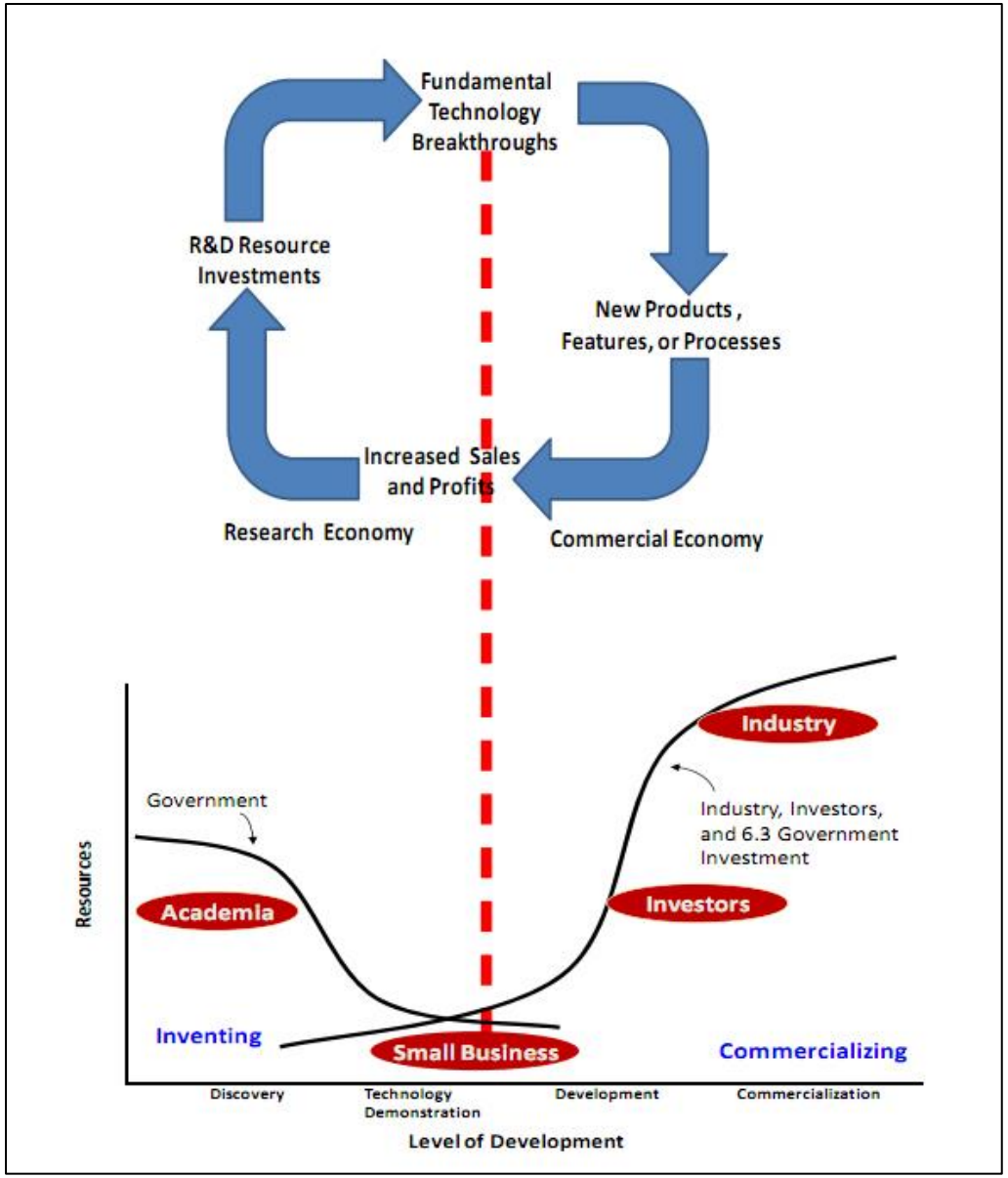
WHAT IS NEXT?

The transformation of knowledge into innovations, for both economic and public purposes, will keep happening at high speed.

Machine and collaborative work will continue to lead to:

- **communication between systems and the sharing of information between geographically different areas; and**
- **computational tool to analyze large amounts of data for a variety of scientific studies**

INNOVATION ECOSYSTEM



The Corporate Innovation Ecosystem: Understanding the Players, Tensions, and Key Strategic Questions

XPLANATIONS by XPLANE

Why is corporate innovation so difficult? A broad coalition of players, inside and outside of your organization, must be aligned for real innovation to take hold—and the different constituencies don't always share the same motivations and incentives. Use this map and the discussion questions below to engage the players, start conversations, and build a shared understanding of common goals, so that you can work together to make meaningful progress.

THE CORE

The core business is the source of profits and power. When it's doing well, there's little hunger for real innovation. When it's struggling, the first impulse is to cut costs rather than invest in new products and services. Without long-term support from executives in the core, innovation efforts fail.

1. **CEO and Leadership Team**
At some companies, a sole C-level executive is the key innovation cheerleader. Innovation groups benefit from broader support throughout the core business, though it's best to avoid creating a 20-person innovation committee that can find plenty of reasons to kill promising projects.

2. **Business Units**
Business units tend to want incremental ideas that can deliver revenue in the short-term, rather than disruptive innovations that might undercut the current offering.

3. **IT,** 4 **Finance,** 5 **HR, and** 6 **Marketing**
Some of these functions can slow the momentum of innovation teams, dwelling on risks or following "standard procedure." Some may feel they should own innovation. It's best to start cultivating allies early rather than late.

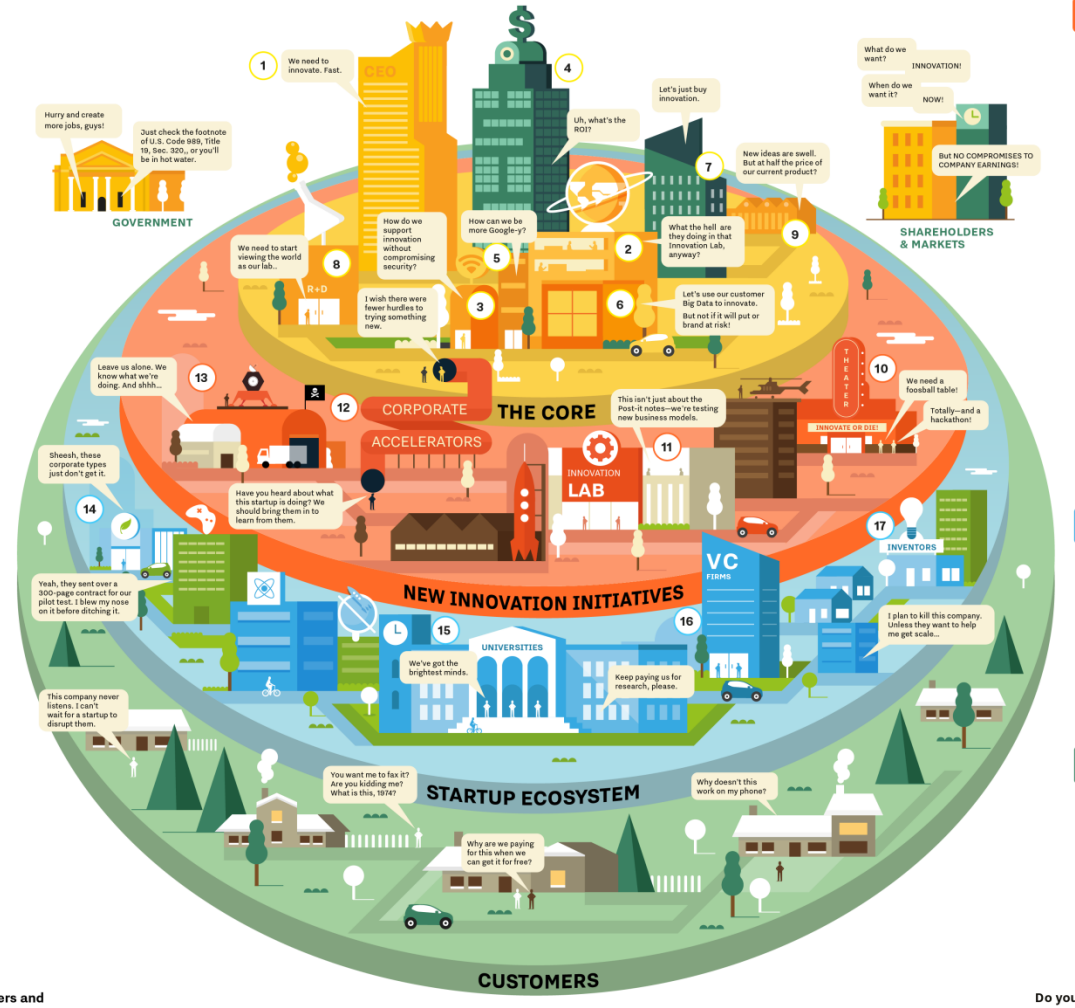
7. **Corporate Development**
"Buying innovation" through acquisitions is something many companies prefer over organic innovation, though the price can be steep and integration can be a challenge.

8. **Research and Development**
Companies with long-standing R&D groups sometimes feel frustrated. Should all ideas about the future of the business come from R&D? These groups can also be insular and reluctant to source solutions from outside the company. But R&D done right can attract top talent and create competitive advantage.

9. **Sales and Support**
Sales can be a rich source of insights about customer problems, which innovation groups would be wise to address. The sales and support teams can also gripe about selling something that's tough to support, priced too low, or relies on a different business model.

DISCUSSION QUESTION:

What incentives can you put in place for these constituencies to embrace new ideas and help launch them, rather than poking holes and withholding resources?



NEW INNOVATION INITIATIVES

Innovation initiatives tend to sit at the edge of the business, without the same resources or attention as the core.

10. **Innovation Theater**
Coming soon...the splashiest spectacle you've ever seen! Watch the CEO pass out trophies. Marvel as a visiting keynote speaker shares the secrets to brilliant ideas in 60 minutes or less. It can be exciting the first time around, but will people return for the sequel?

11. **Innovation Labs and Incubators**
At their best, innovation labs create a new place for exploring new technologies, building prototypes, and collaborating with customers. At their worst, they're Disney-esque showcases intended to impress visitors and prospective hires.

12. **Corporate Accelerators**
With the right structure and marketing, accelerators can attract startups working in your industry, and potentially spark investments, pilot tests, and partnerships.

13. **Skunk Works**
Insulated from near-term demands, this crew can focus on "blue sky" projects with major potential. The risk? Insufficient support from the core business when it's time for launch.

DISCUSSION QUESTIONS:

What is the expected outcome from your innovation initiative, over what timeframe? What resources will you need?

STARTUP ECOSYSTEM

With so many meetings, it can be tough for executives to escape the building. Innovation teams seek to change that dynamic by creating new ways to connect with 14 startups, 15 university researchers, 16 venture capitalists, and even 17 solo inventors who may supply winning solutions to a crowdsourcing competition.

DISCUSSION QUESTIONS:

How can you reduce the friction of working with outsiders, and position your company as the "collaborator of choice" in your industry?

CUSTOMERS

At most companies, sales and marketing departments feel like they "own" the customer relationship, but a growing number of companies embracing the concepts of "lean startup," "design thinking," or "customer co-creation" are allowing more employees to interact with customers. Even when this doesn't result in new revenue, it can strengthen customer loyalty, which is always a win.

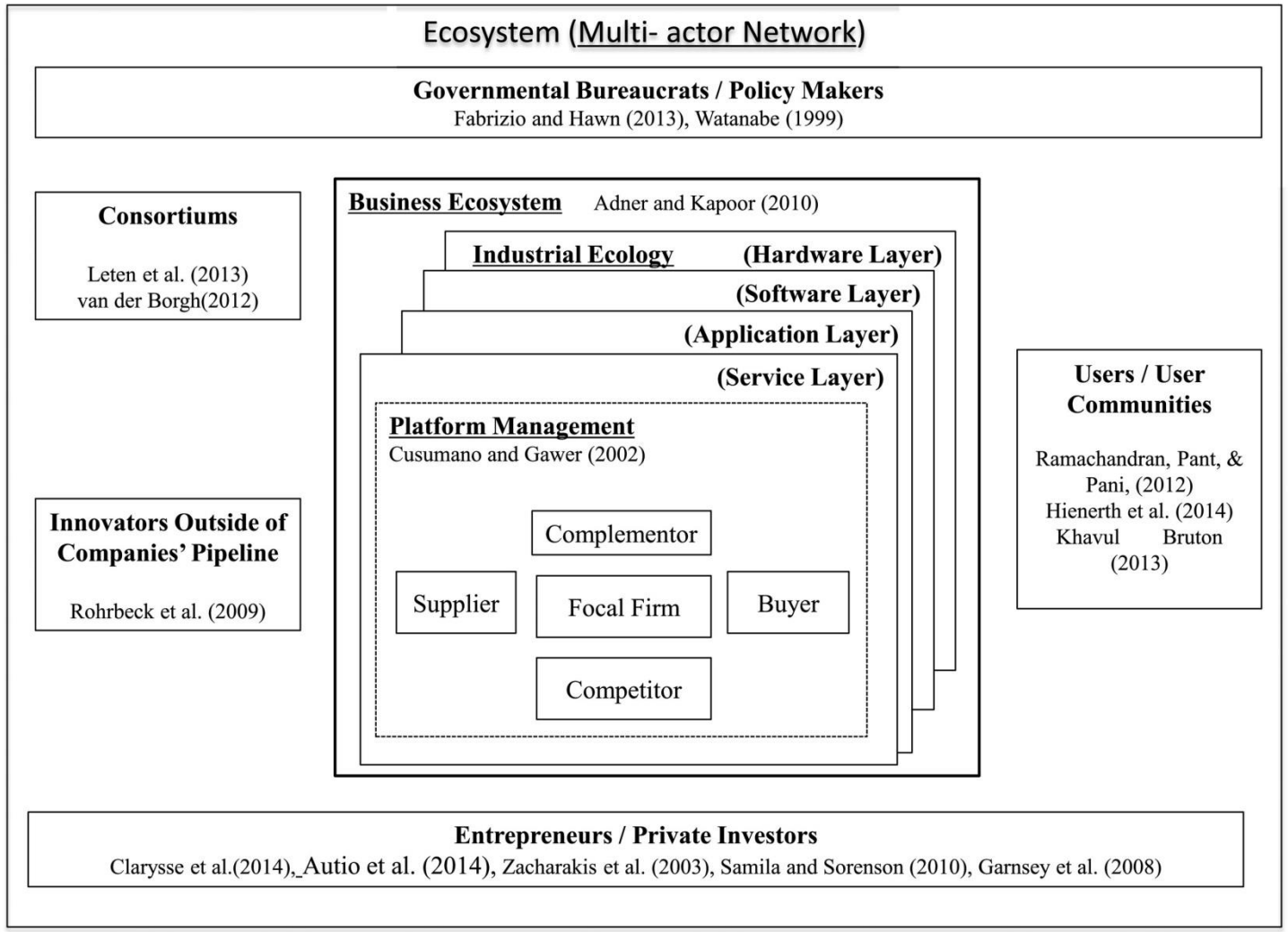
DISCUSSION QUESTIONS:

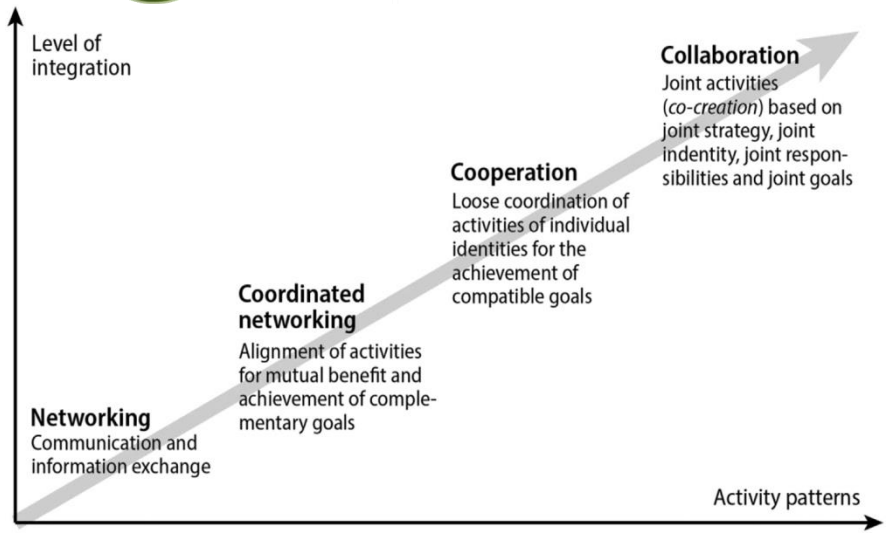
What barriers exist to bringing customers into the innovation process? How can you quickly test new concepts with them?

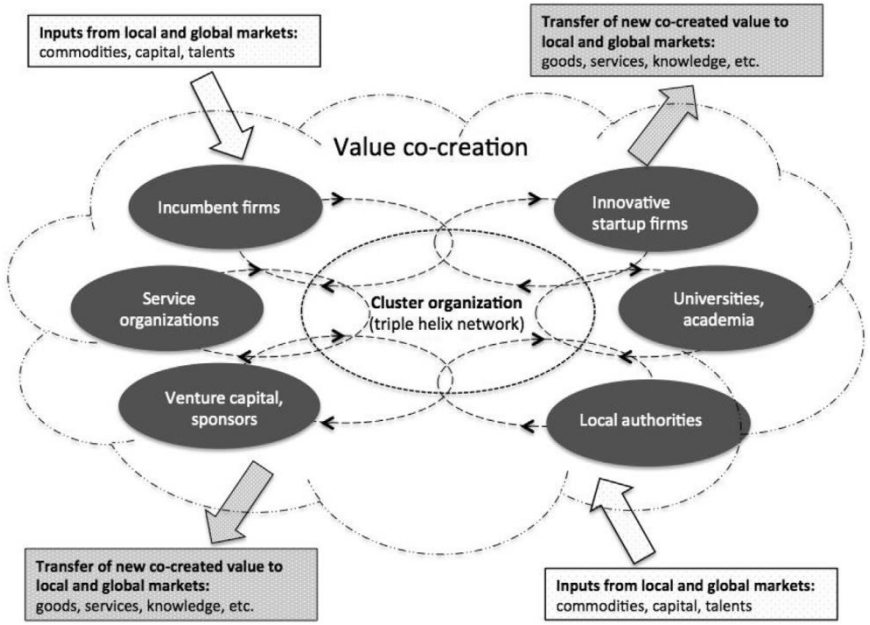
INNOVATION LEADER **Learn more about these players and questions at www.innovationleader.com**

Illustration: how consulting presents innovation ecosystem

ECOSYSTEMS

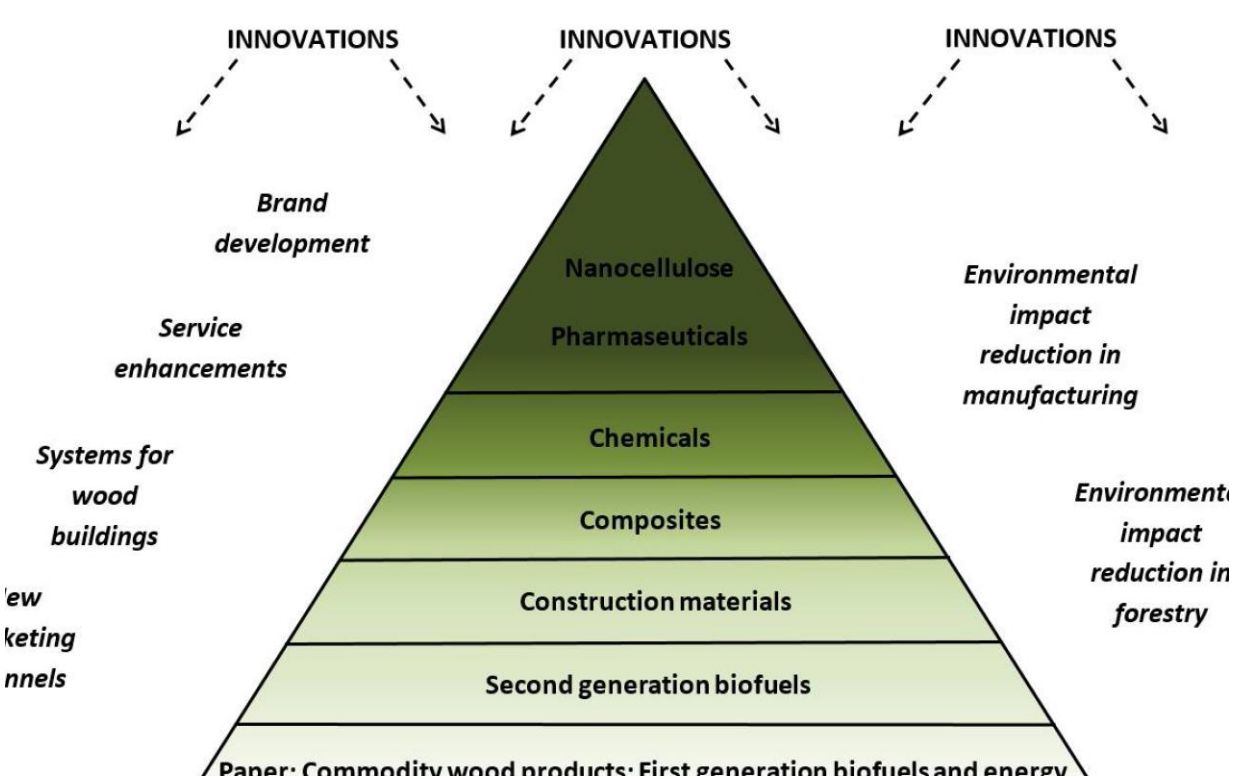


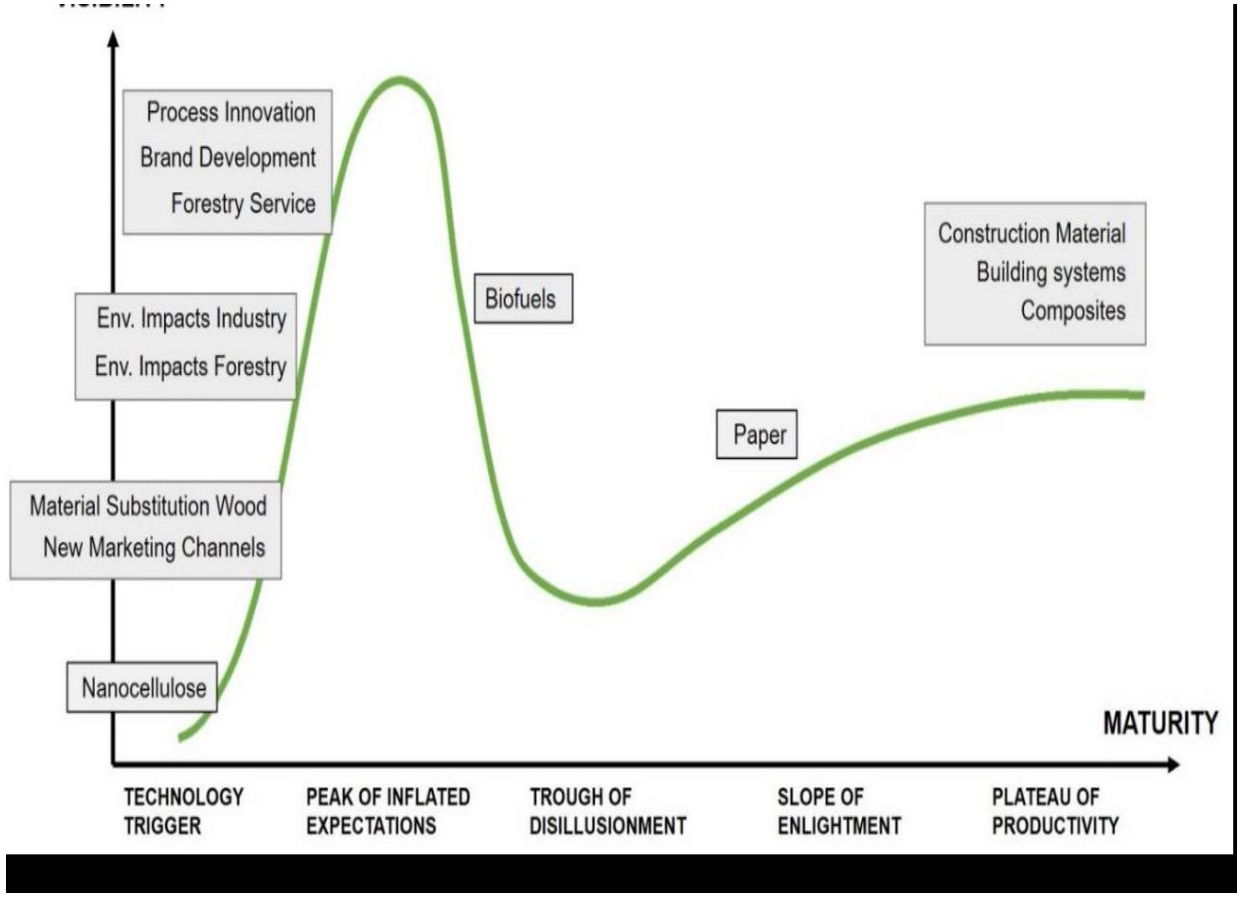




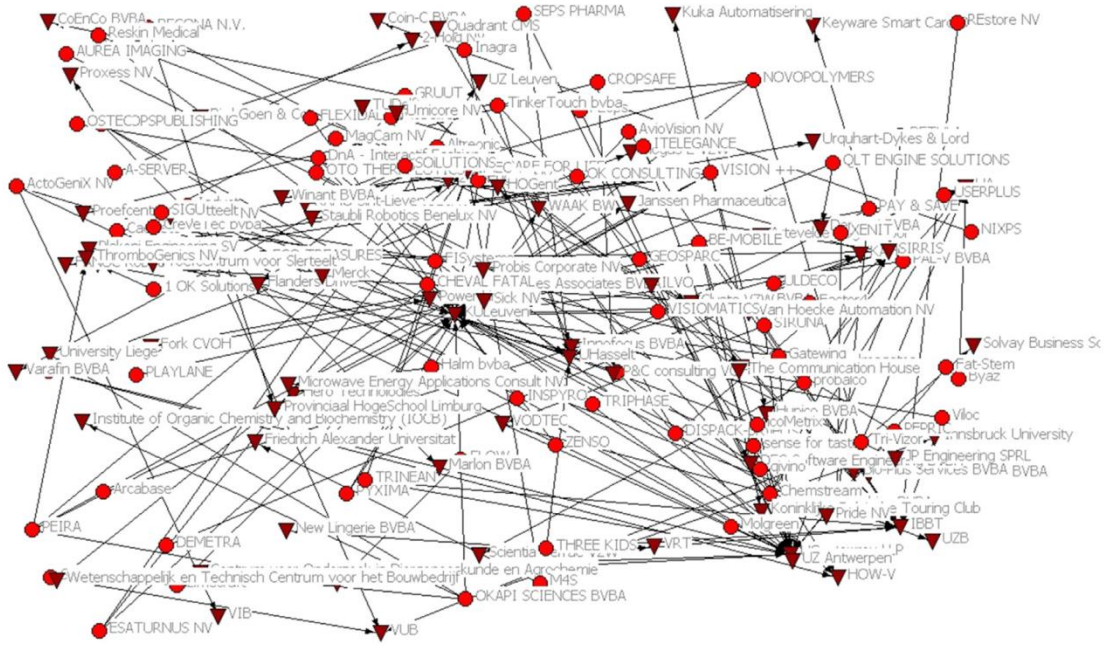
Tsujimoto et al. A review of the ecosystem concept — Towards coherent ecosystem design. Technol Forecasting & Social Change (2019)

Russell & Smorodinskaya. Leveraging complexity for ecosystemic innovation. 2019





Stern et al. Perceptions on the Importance of Forest Sector Innovations: Biofuels, Biomaterials, or Niche Products. Forests · May 2018



	Type	Degree (centrality)	Norm. Degree (centrality)	Network Centralization	Network Density
Network				11,75%	0,007
KULeuven	University	27	16.265		
UGent	University	20	12.048		
IBBT (iMinds)	PRO	11	6.627		
SIRRIS	PRO	8	4.819		
IMEC	PRO	8	4.819		
UA	University	5	3.012		
UHasselt	University	5	3.012		
HOGent	University	4	2.410		
KAHO Sint-Lieven	University	4	2.410		

Degree (centrality) = number of direct links
Norm. Degree (centrality)= (number of direct links/total number of links)*100
Network Centralization = Centralization= 100* Σ(C*-Ci) / Max Σ(C*-Ci) , where C* is the centrality of the most central actor and Ci, the centrality of all the other I actors
Network Density= Sum of existing ties divided by the number of all possible ties

Knowledge, business and financial partners are highly connected in innovation ecosystems

Clarysse et al. Creating value in ecosystems: Crossing the chasm betweenknowledge and business ecosystems . 2014

Lovic et al. Synthesis on forest bioeconomy research and innovation in Europe. 2017

STAGES OF A DISRUPTIVE TECHNOLOGY PROCESS

I. Analyzing the gaps existing in customer requirements, current market, and existing technology
II. Concept development — defining the product and analyzing the R&D capability of the firm
III. Preliminary design of a product
IV. Product and technology development
V. Pre-product launching stage — including product marketing, pricing, and preliminary assessment of the product adaptability in the target market
VI. Product launch to its target market segment
VII. Product improvement from feedbacks (as well as own R&D) in order to capture the incumbent market in the long run

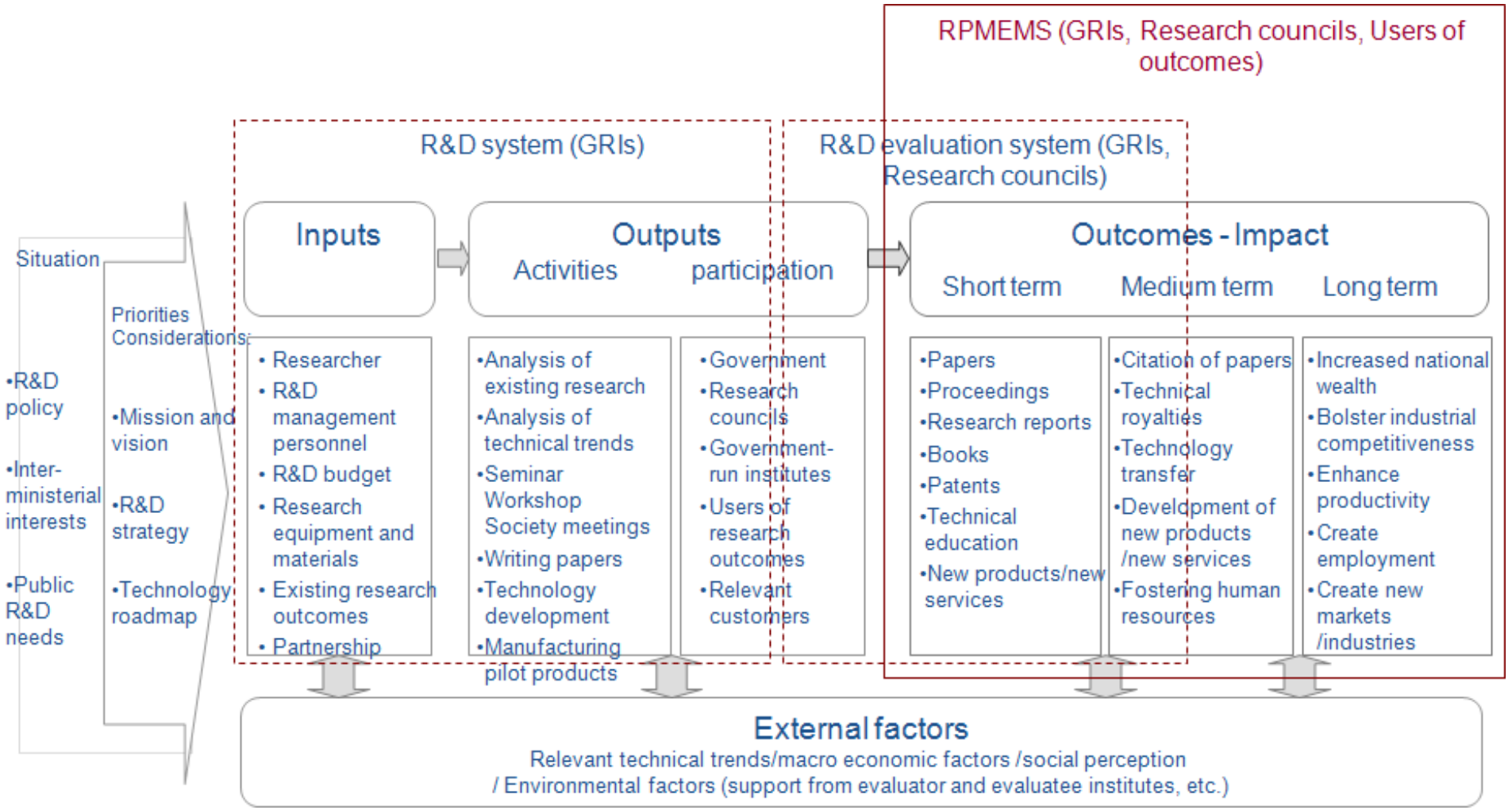
Ganguly et al. IDENTIFICATION, CLASSIFICATION, AND PRIORITIZATION OF RISKS ASSOCIATED WITH A DISRUPTIVE TECHNOLOGY PROCESS 2011

STAGES OF A DISRUPTIVE TECHNOLOGY PROCESS

1. **Economic risks** The risks associated with monitory/financial loss that would result from an insufficient or failed DT process
2. **Time/schedule risks** The risks associated with the likelihood of failing to achieve time/schedule deadline at various stages of a DT development life cycle and the consequence of that failure
3. **Operational risks** The risk or loss resulting from incomplete/inadequate/failed internal processes, including human resources and organizational dynamics, at various phases of the DT development life cycle
4. **Customer risks** The risks associated with the loss in the value of the product/technology to the targeted customer segment as a result of certain changes that largely impacts the consumer behavior and market trends
5. **Market risks** The loss associated due to a change in market trend and competitors activities during the development of the DT or the product arising out of it
6. **Legal risk** The risks associated with uncertainty in the interpretation or application of contract, regulations, and intellectual properties (IPs) that the DT might require
7. **Technical risks** Likelihood of failure of a project due to activities related to technical and engineering processes, engineering design, technology development, and so on
8. **Sociopolitical risks** The uncertainty that an organization might face due to an existing internal or external social policies and political issues as well as any sudden changes of the same
9. **Quality** The risk associated with the disruptive product/technology failing to deliver the desired (or acceptable) level of quality demanded by the targeted market segment

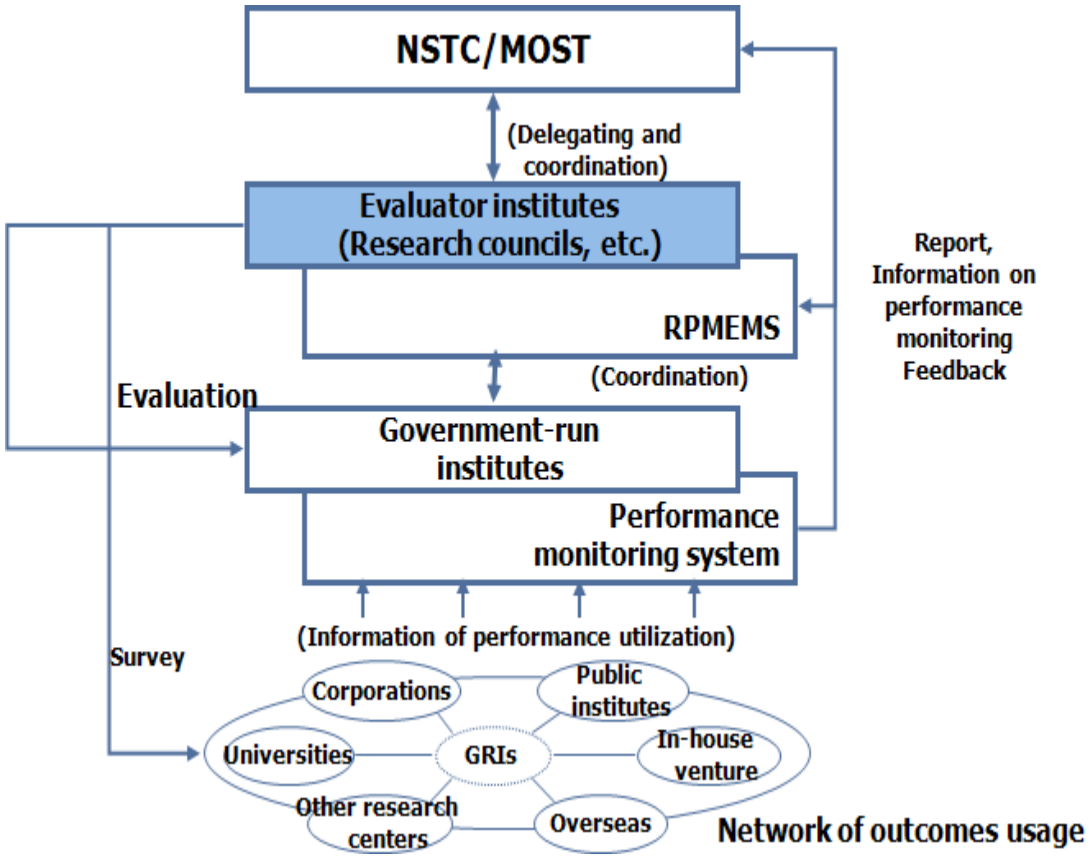
Ganguly et al. IDENTIFICATION, CLASSIFICATION, AND PRIORITIZATION OF RISKS ASSOCIATED WITH A DISRUPTIVE TECHNOLOGY PROCESS 2011

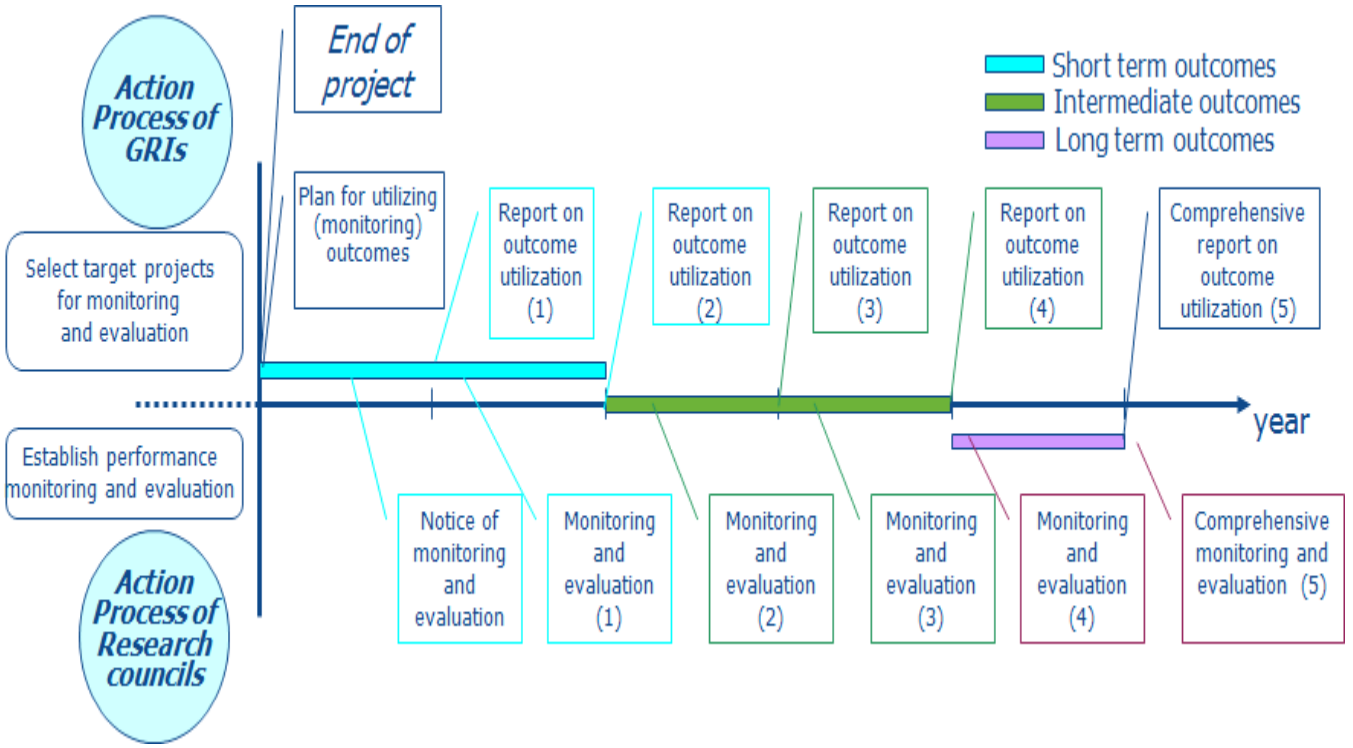
R&D PERFORMANCE



Lee et al. R&D PERFORMANCE MONITORING, EVALUATION, AND MANAGEMENT SYSTEM· 2009

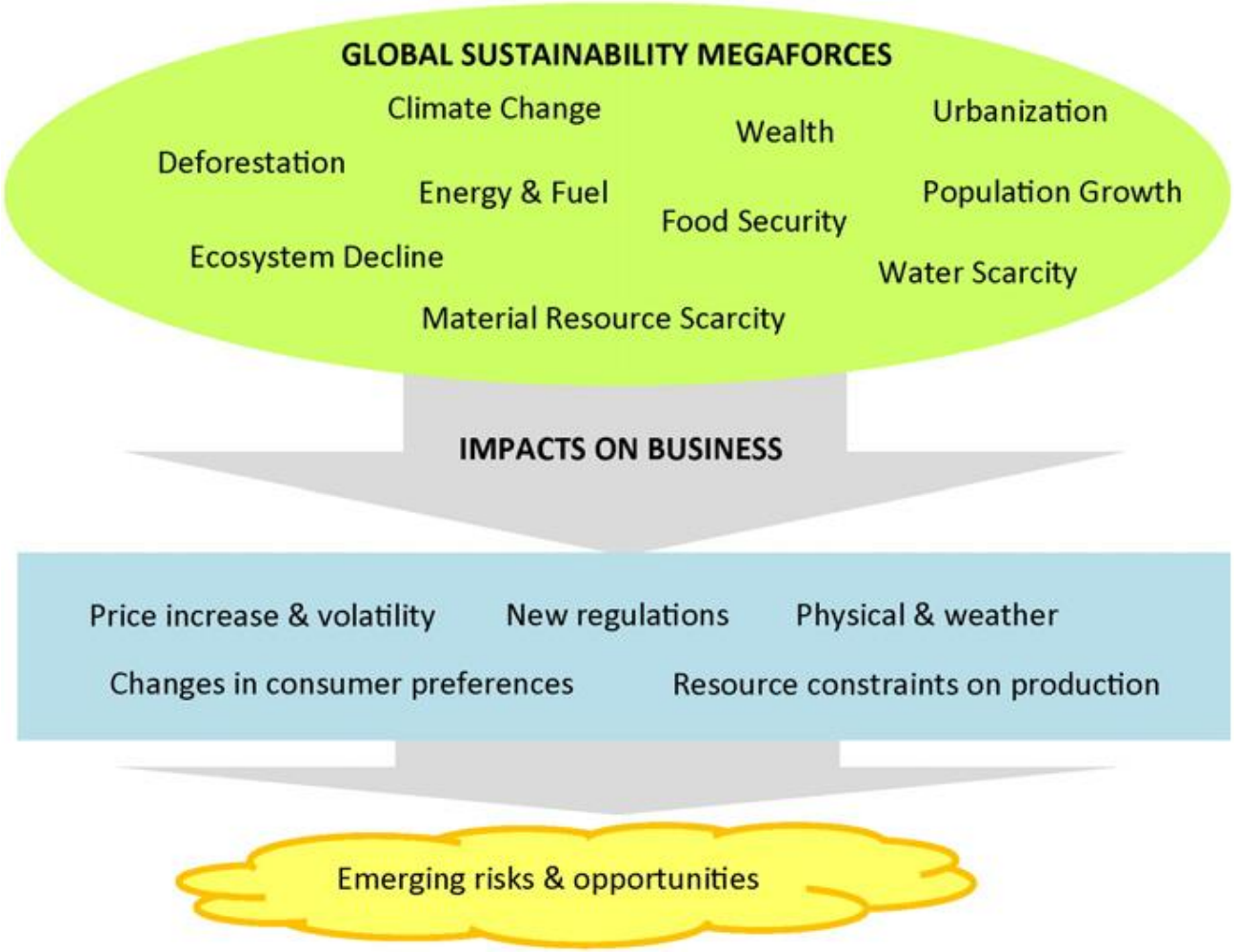
R&D PERFORMANCE

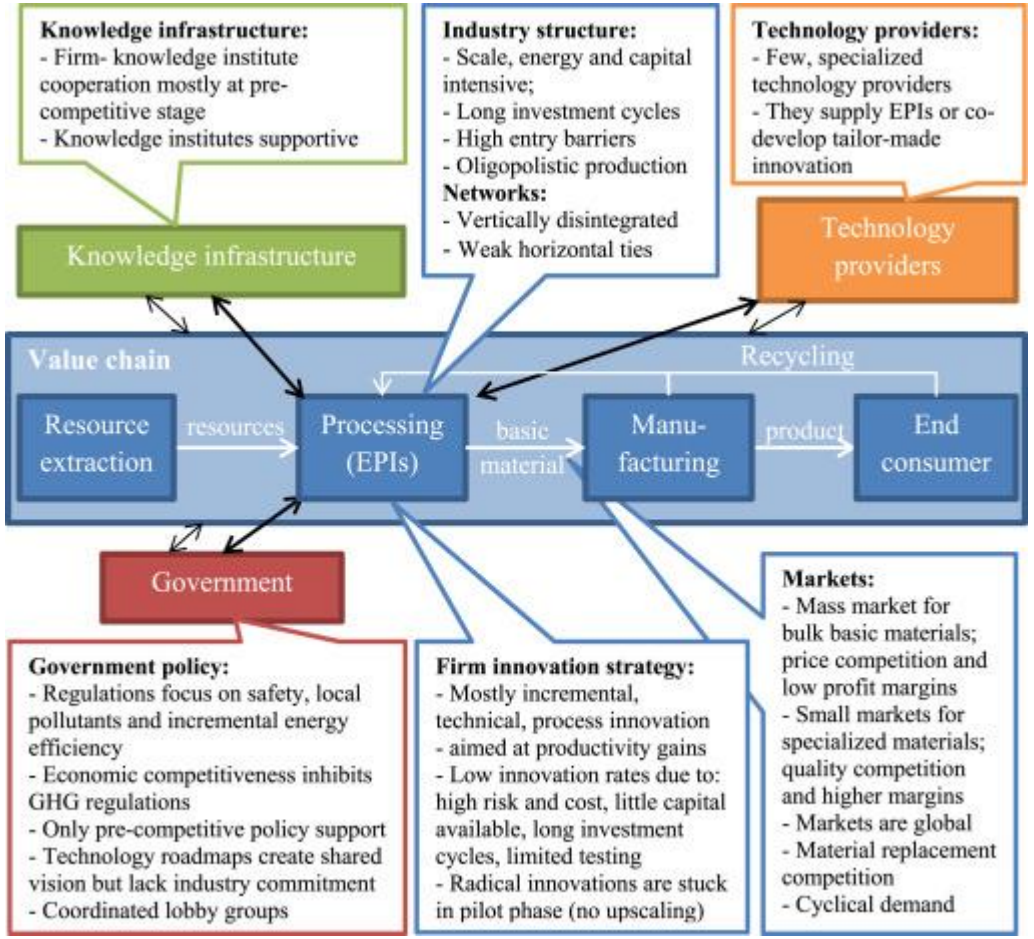




Lee et al. R&D PERFORMANCE MONITORING, EVALUATION, AND MANAGEMENT SYSTEM· 2009

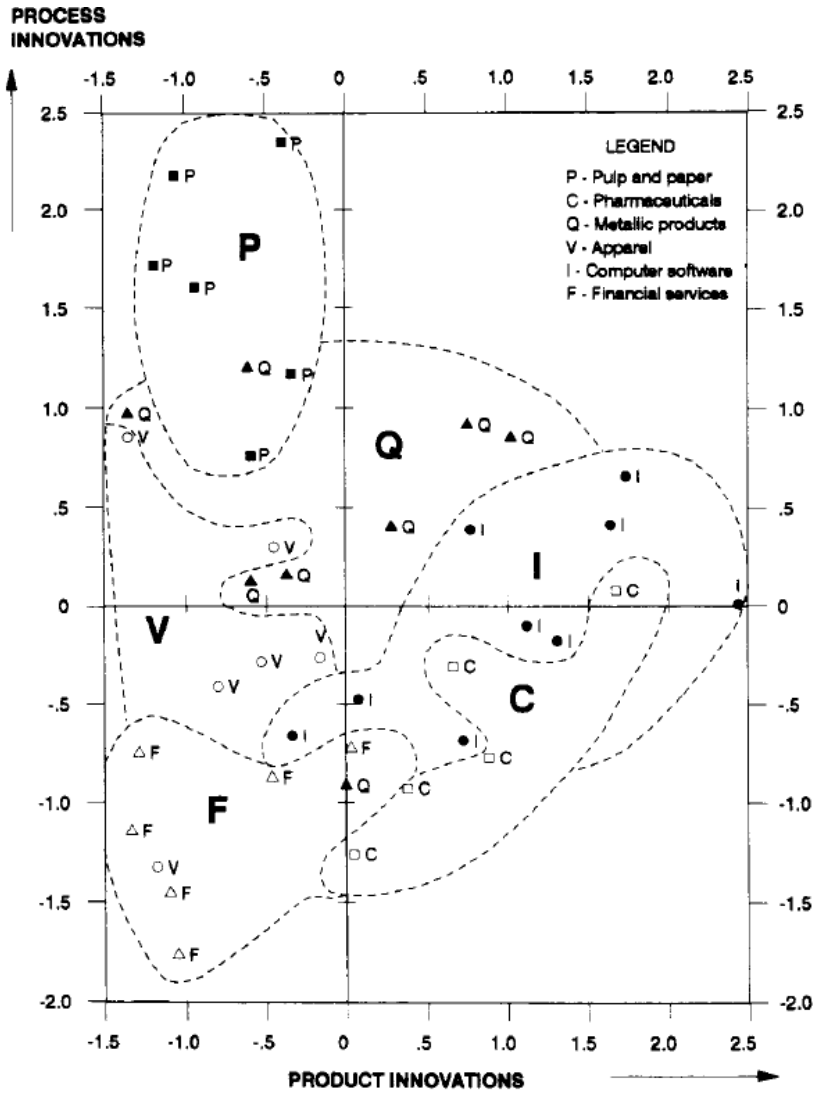
FOREST MEGAFORCES

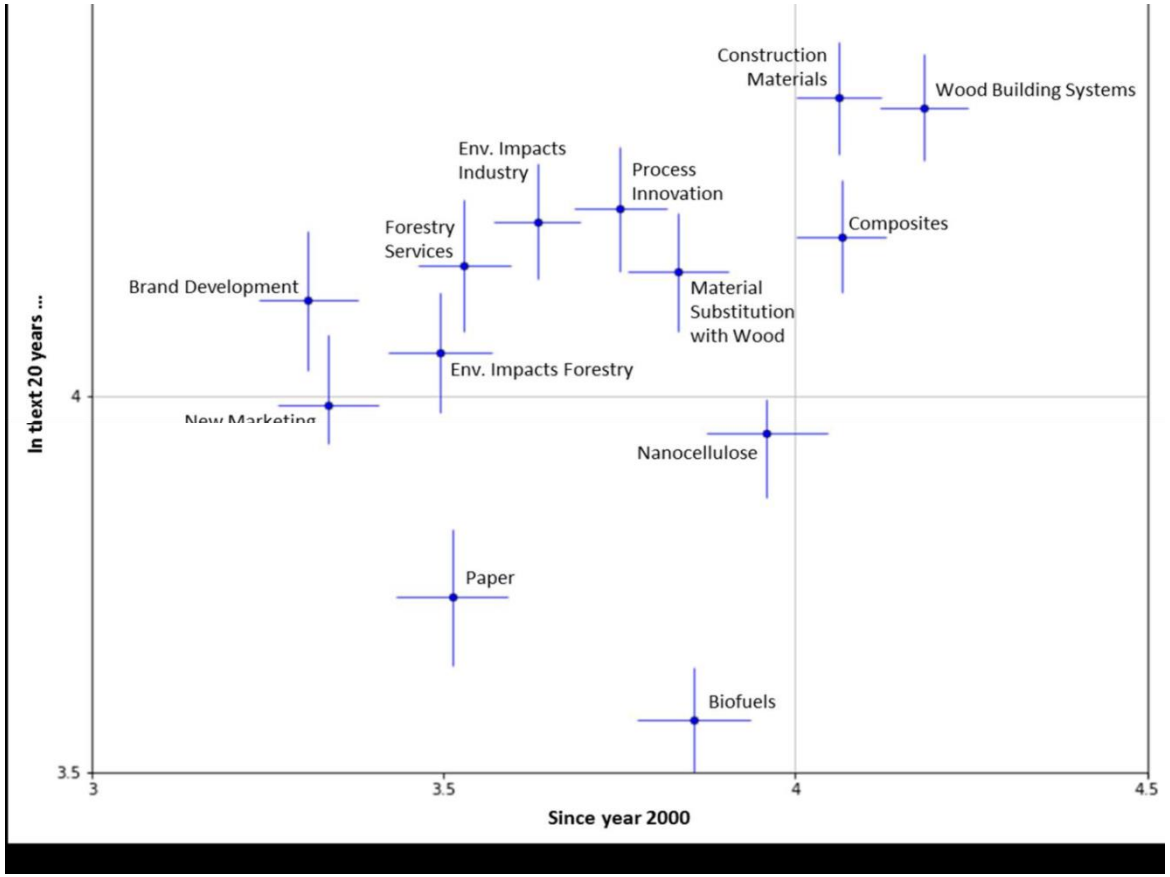




Patari et al. Global sustainability megaforces in shaping the future of the Europeanpulp and paper industry towards a bioeconomy · 2016

INNOVATION

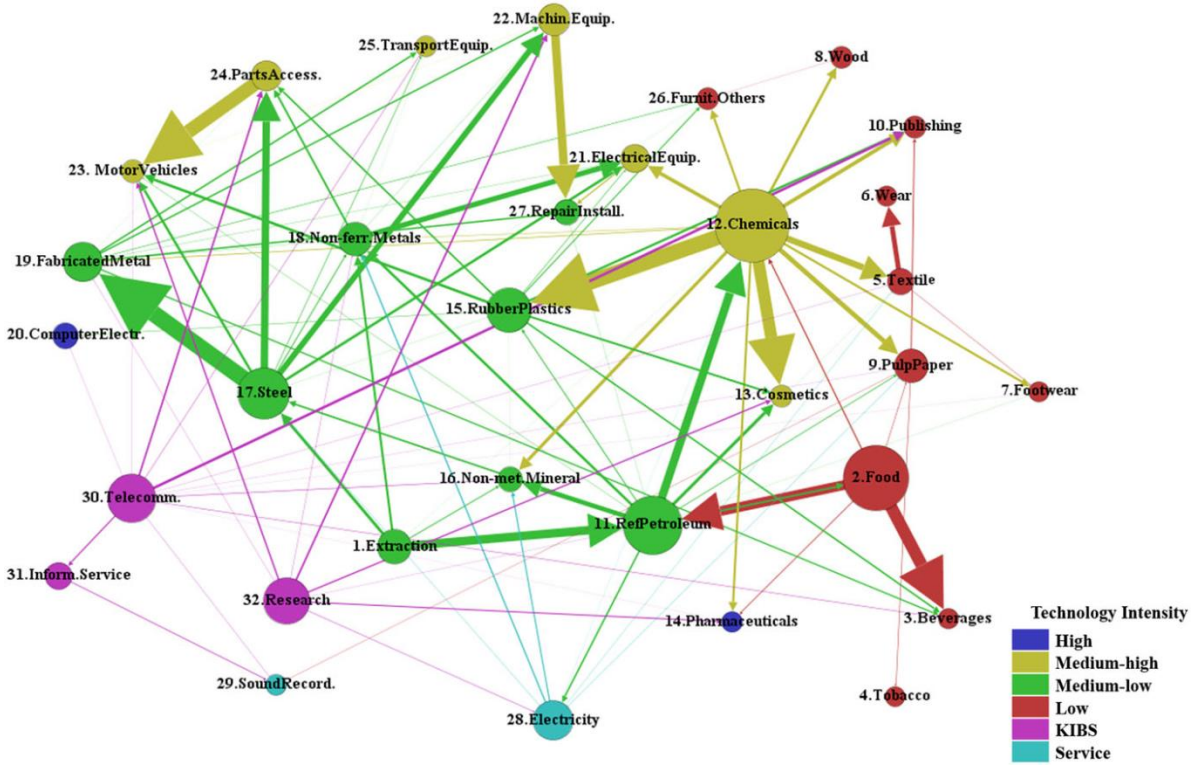




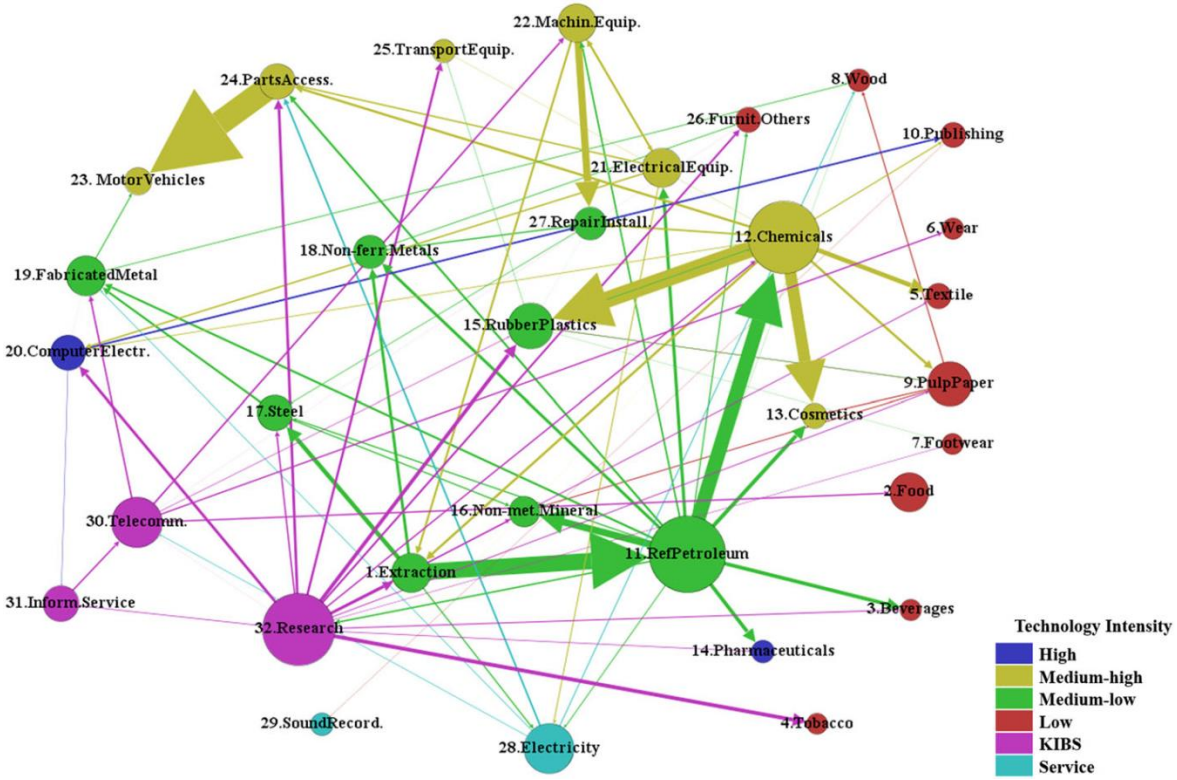
Miller and Blais: Modes of innovation. IEEE Transactions on engineering management. Vol.40, NO3. August 1993.

Stern et al. Perceptions on the Importance of Forest Sector Innovations: Biofuels ,Biomaterials, or Niche Products. Forests ·.May 2018

TOTAL INNOVATION EXPENDITURES Intersectoral flows of embodied knowledge in Brazil

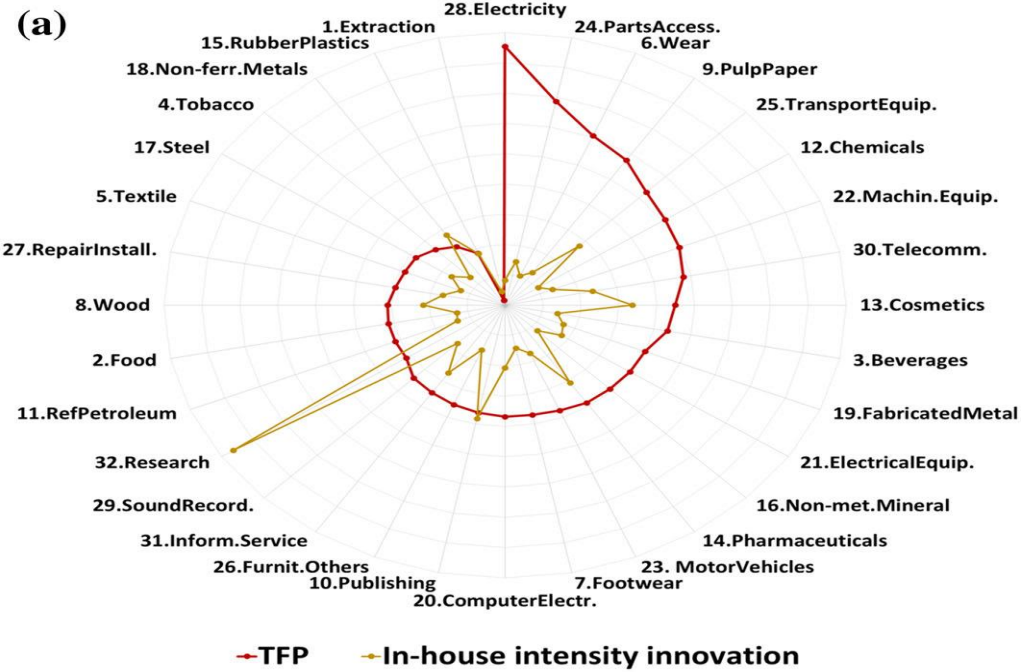


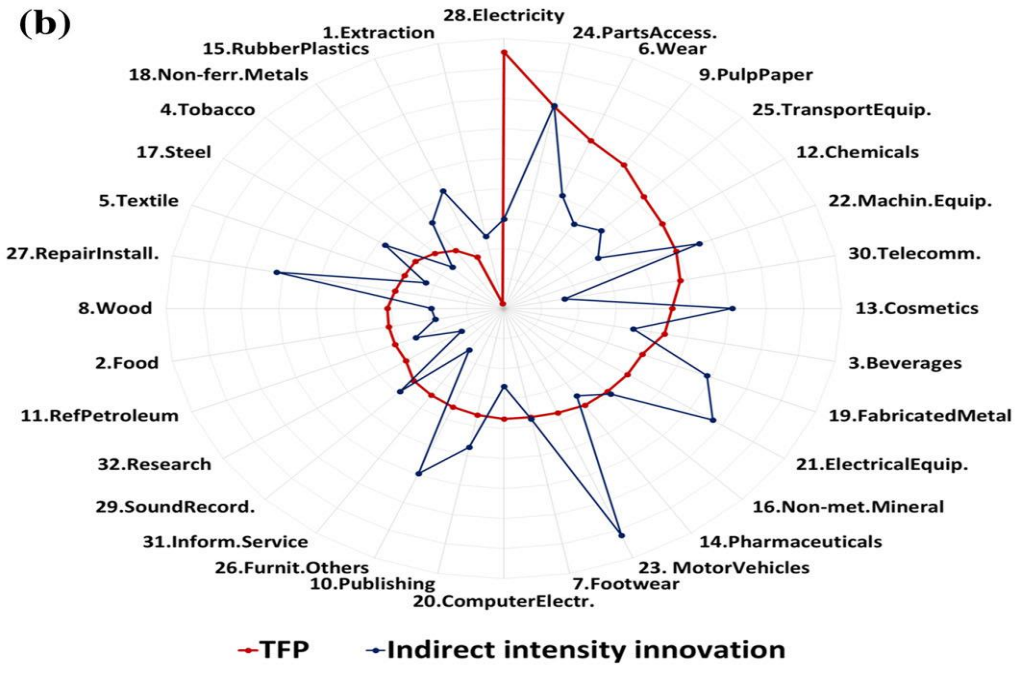
R&D EXPENDITURES : Intersectoral flows of embodied knowledge in Brazil

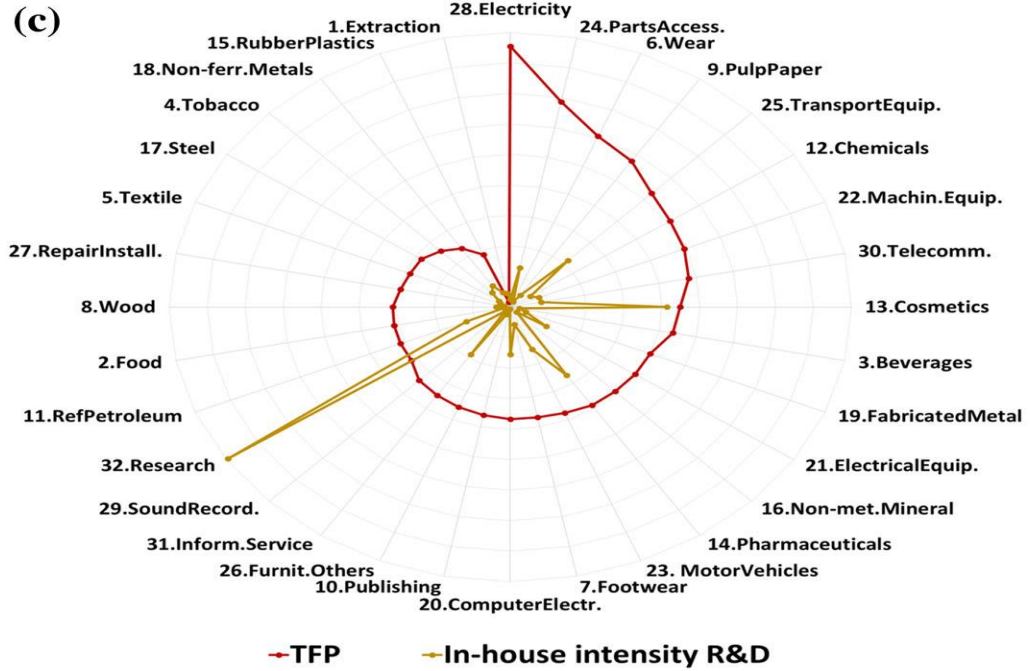


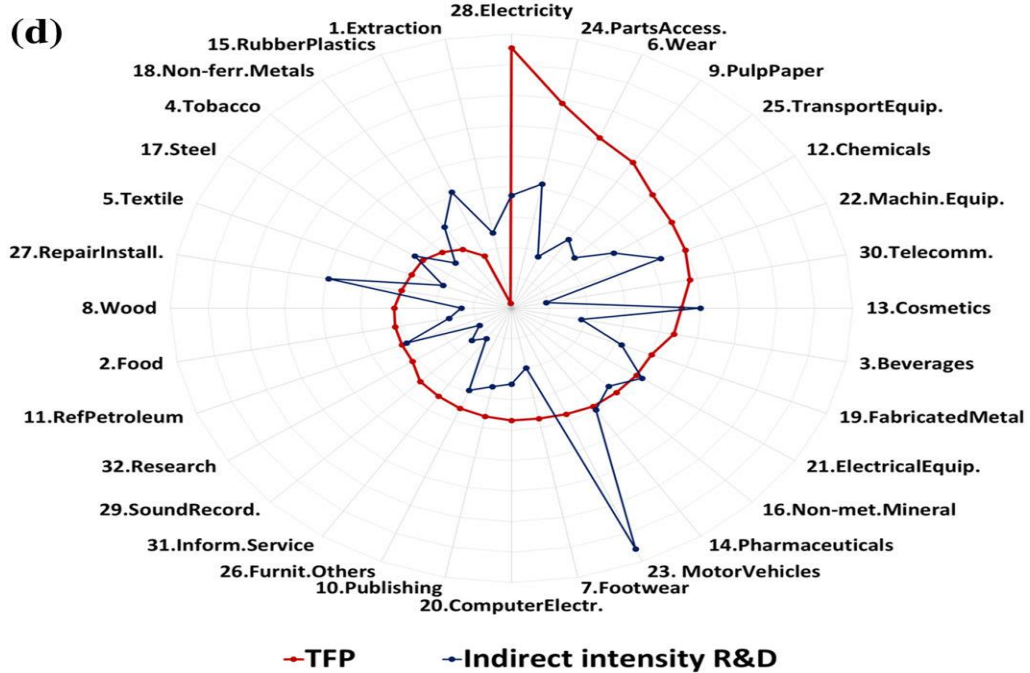
Gonçalves et al. Estimating intersectoral technology spillovers for Brazil . J Technol Transf (2017)

RELATIONSHIP BETWEEN EMBODIED KNOWLEDGE INTENSITY AND PRODUCTIVITY IN BRAZIL









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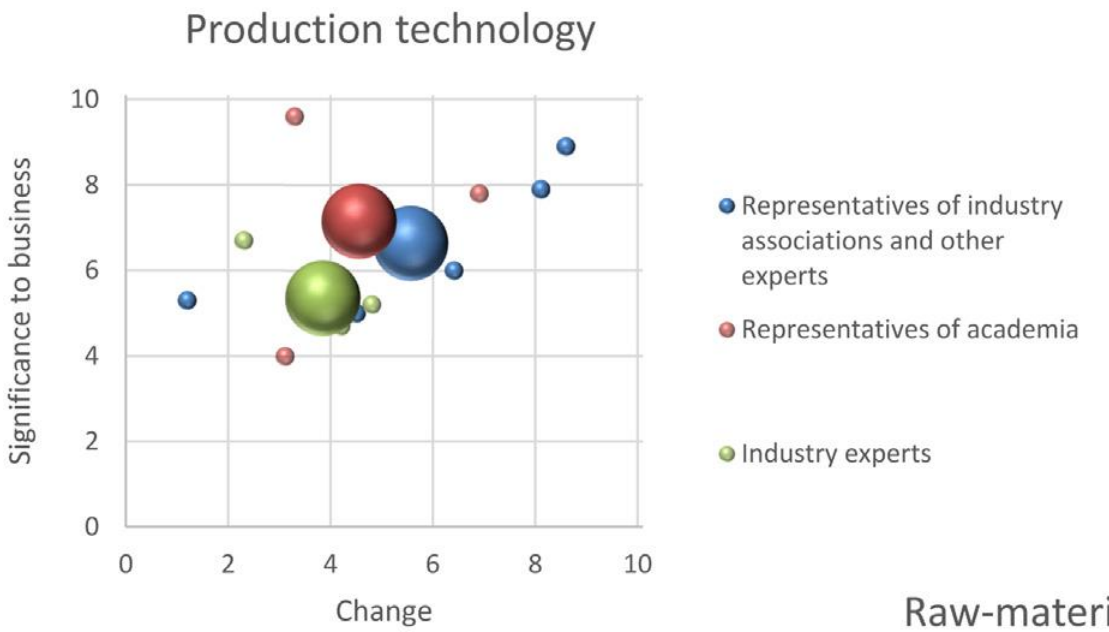
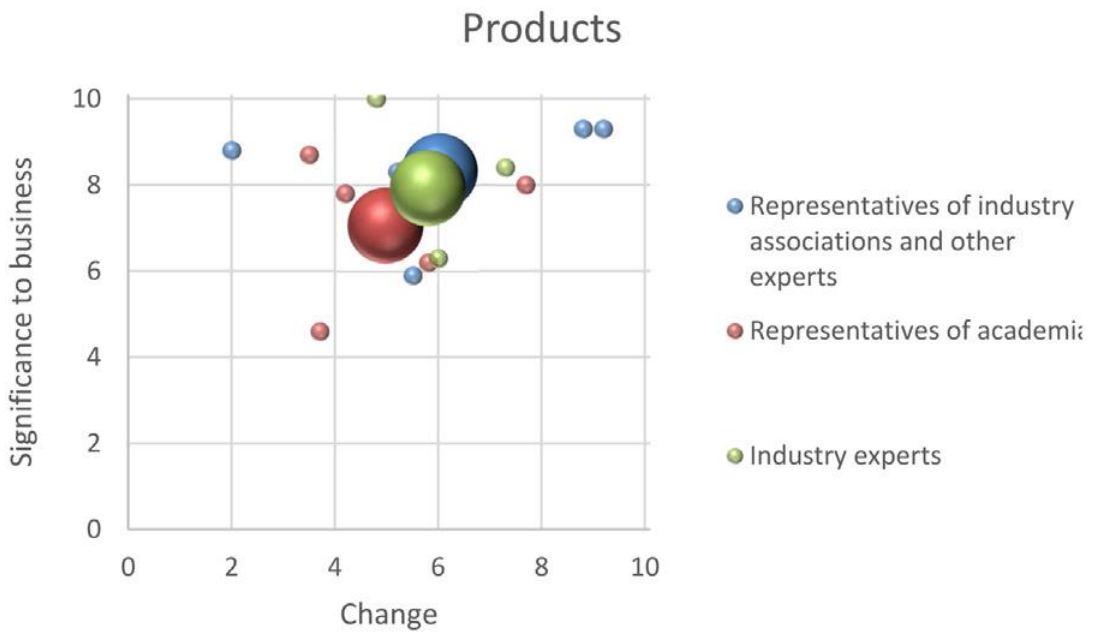
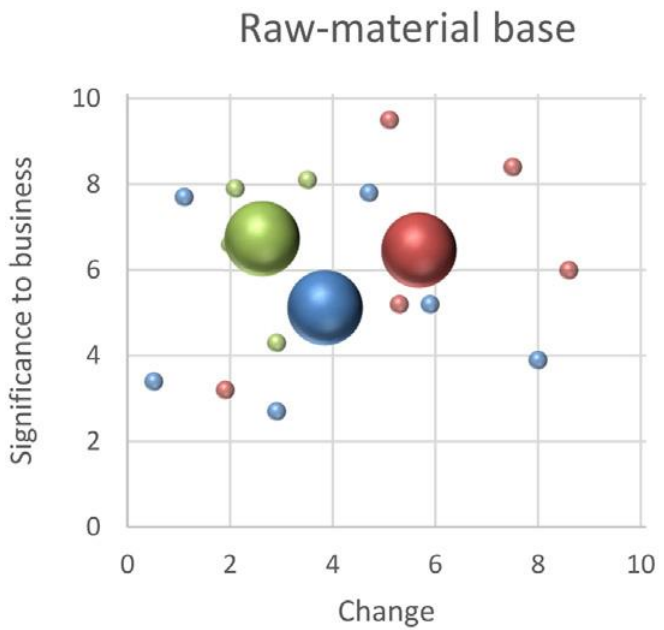
EUROPEAN PULP AND PAPER INDUSTRY PREDICTED CHANGE 2030

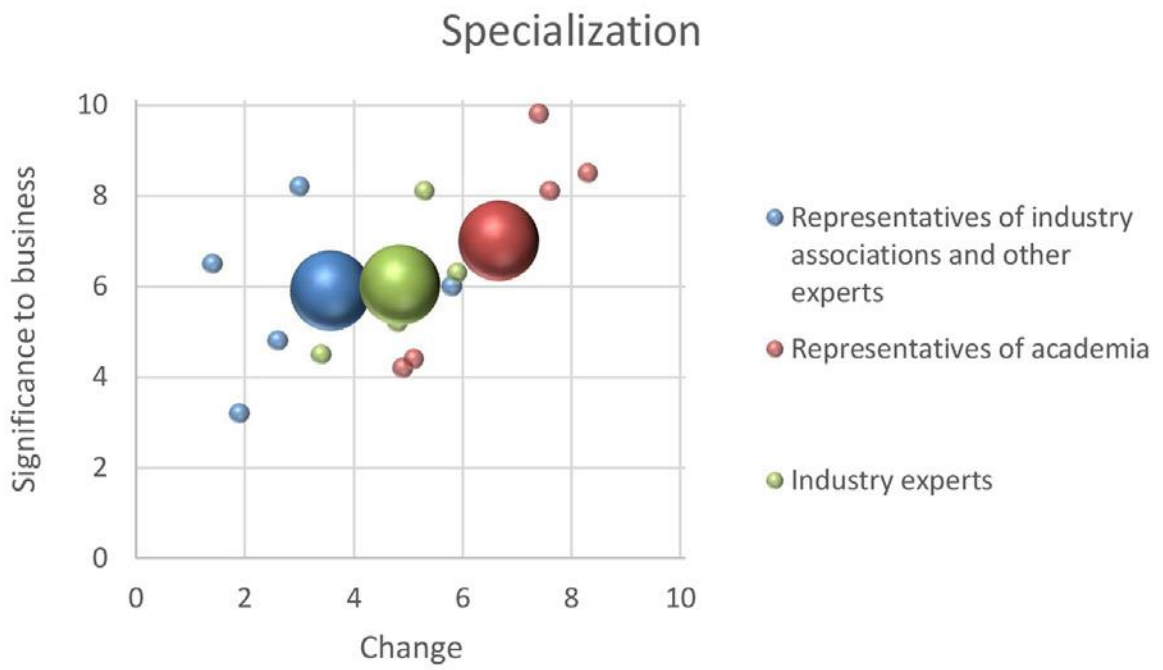






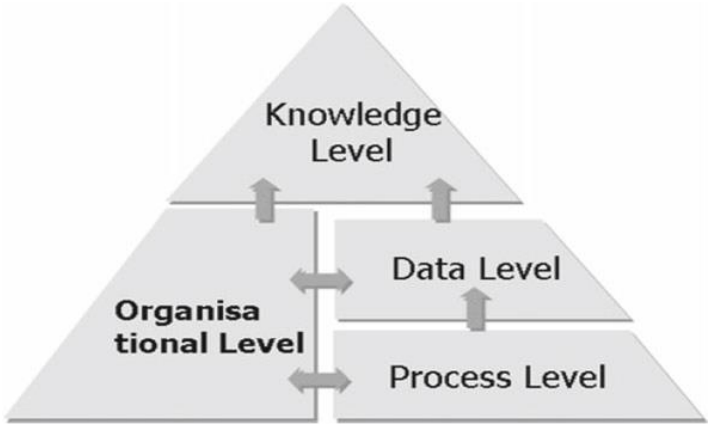
Toppinen et al. The European pulp and paper industry in transition to a bio-economy. Future (2017)

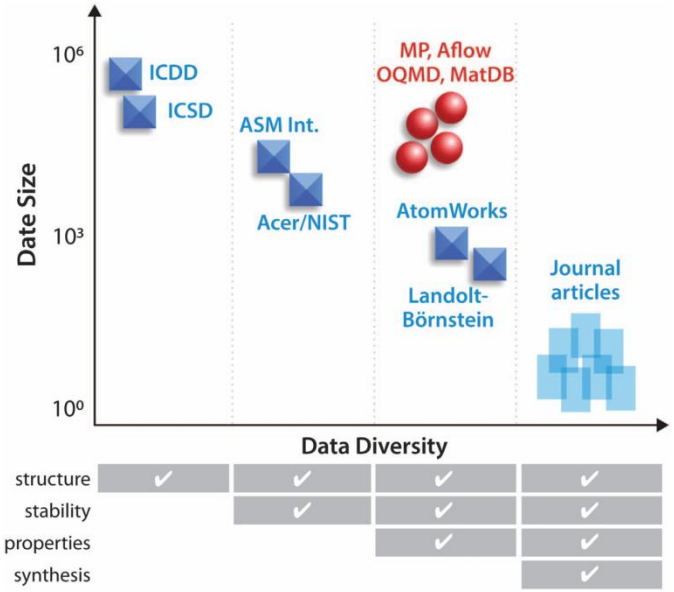
EUROPEAN PULP AND PAPER INDUSTRY PREDICTED CHANGE 2030

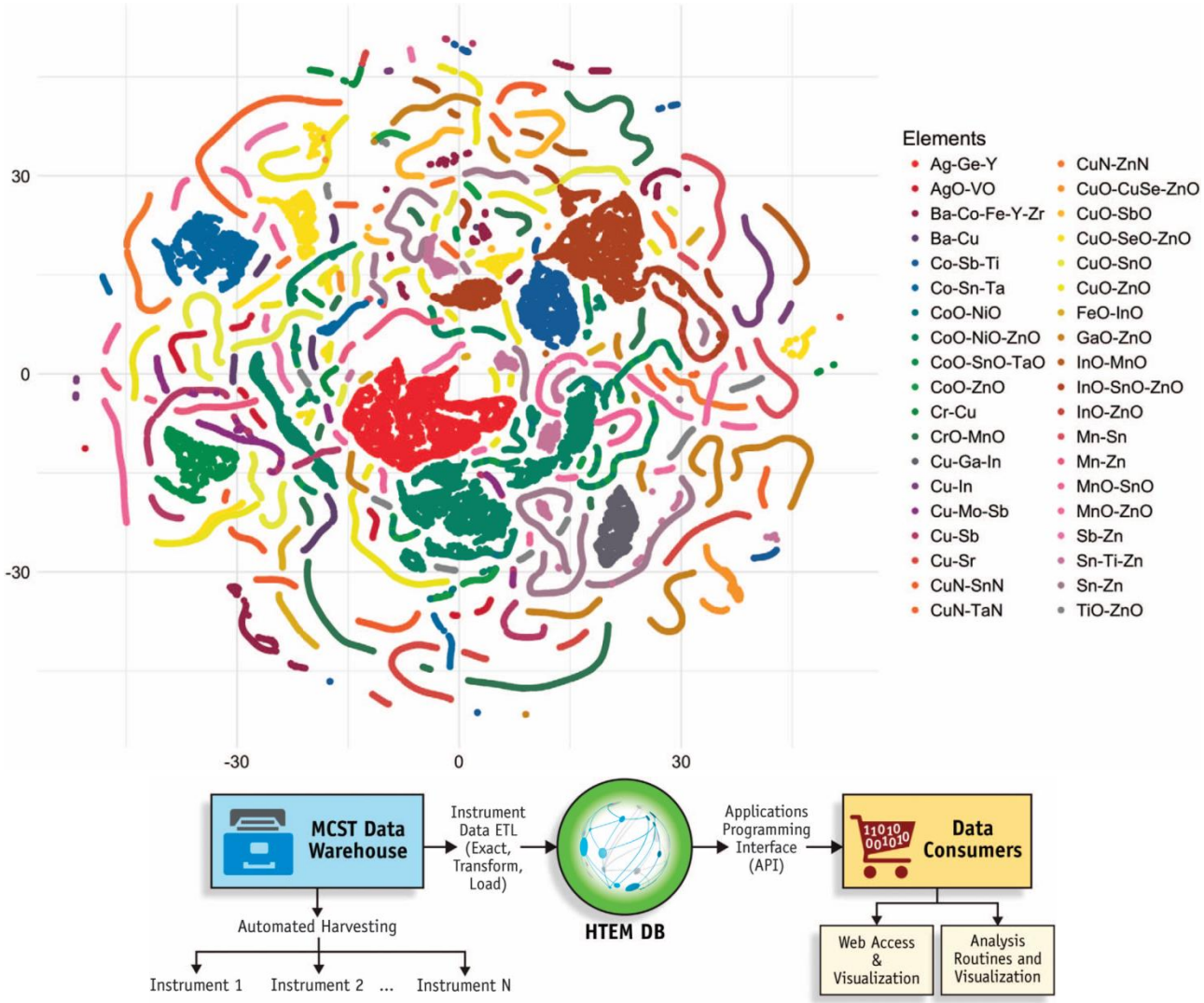


Toppinen et al. The European pulp and paper industry in transition to a bio-economy. Future (2017)

Reimage Research Methodology as Data Science







Sarikhani1 &· Andrew Wendelborn. Mechanisms for provenance collection in scientific workflow systems . 2018

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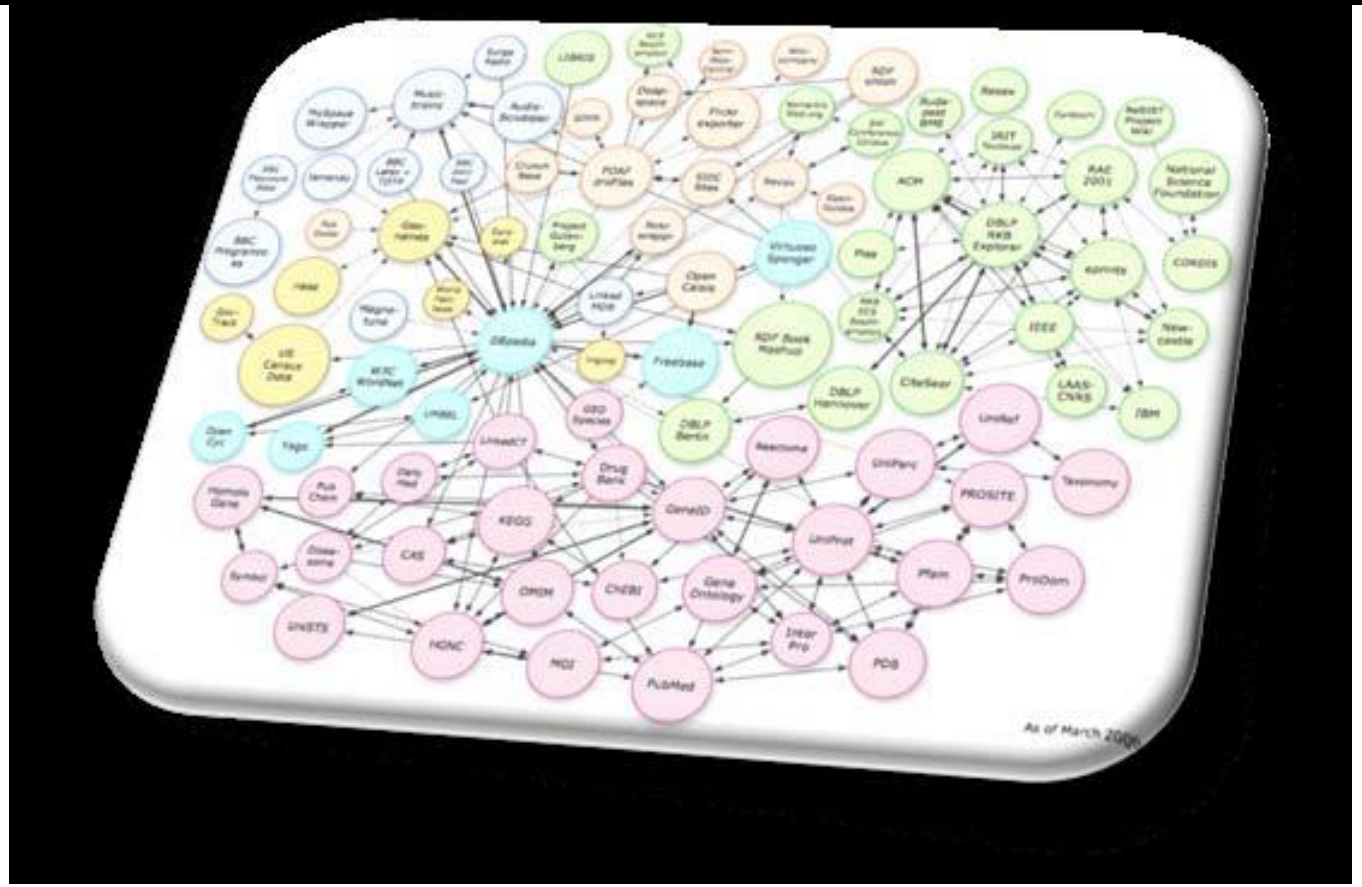
Daniel.Reimaging Research Methodology as Data Science. 2018

MOVING TO A WORD WHERE ALL DATA IS LINKED



THANK YOU FOR YOUR ATTENTION!

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sonwpark@usp.br

CORREALIZAÇÃO

REALIZAÇÃO