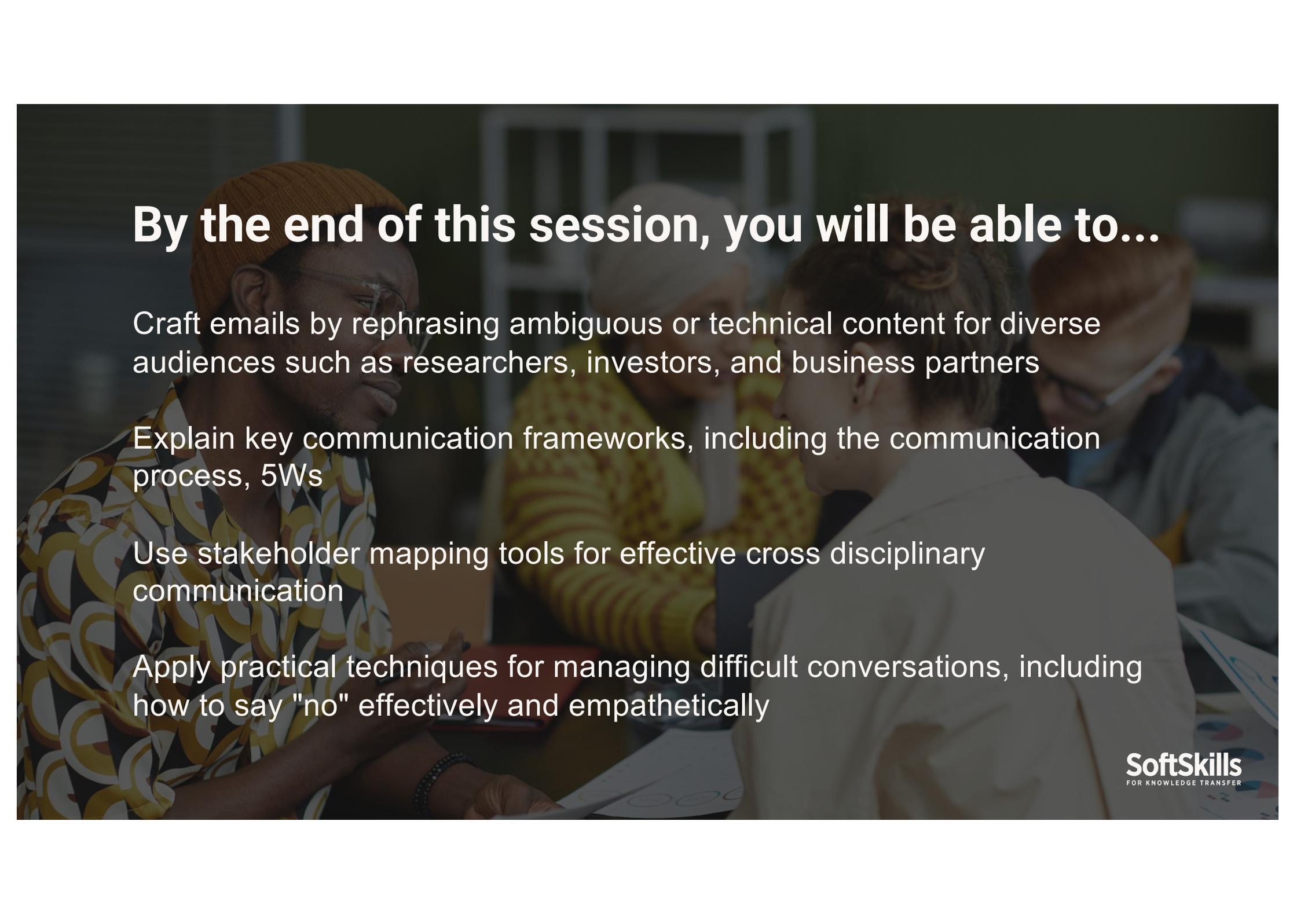


Welcome: Communication with Impact for Knowledge Transfer

KTSoftSkills - Soft Skills for Knowledge Transfer
Project n. 2022-1-IT02-KA220-HED-000089663



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By the end of this session, you will be able to...

Craft emails by rephrasing ambiguous or technical content for diverse audiences such as researchers, investors, and business partners

Explain key communication frameworks, including the communication process, 5Ws

Use stakeholder mapping tools for effective cross disciplinary communication

Apply practical techniques for managing difficult conversations, including how to say "no" effectively and empathetically

Agenda

| Time | Topic | |
|--------|--|-------------------------------|
| 30 min | Introduction & Icebreaker Game | Group Exercise |
| 30 min | "The Email" An exercise on written communication in KT processes | Group Exercise & Discussion |
| 15 min | Break | |
| 60 min | Theories about Interdisciplinary Communication | Mini Lecture & Group Exercise |
| 15 min | Break | |
| 30 min | How to Say "No" | Role-play Exercise |
| 30 min | Debriefing & Wrap up | Group Discussion |

Two Truths and a Lie

Step 1. Prepare three statements about yourself—two true, one false.

Step 2. Tell your statements to the group. The group will guess the false one.



Group Exercise: The Email



Group Exercise: The Email

You are a knowledge transfer professional in the Technology Transfer Office of a renowned university.

You received an email from a researcher in your university. Rephrase the email in a way that you understand.

Share your email with your groupmates.
Discuss the challenges you faced with your task.

Subject: Exciting new commercial activity.

Dear KTO colleague,

We presented some of our latest research conclusions last week at the international conference and lots of people came up to us afterwards telling that this could be applied in industry uses. One company even asked us for a meeting and we will be talking to them tomorrow.

We knew beforehand that there have been challenges in cost effective production of packaging for frozen goods, and now understand that our approaches may solve that problem. We joined your department webinar last month about how research results could be patented and know that we should contact you if we think there is something we should consider.

Can we set up a meeting as soon as possible to discuss what the next steps are?

Many thanks

Professor Enthusiastic

Debriefing

1. Was the email easy to understand and rephrase? If not, why?
2. What makes an email effective?
3. Do you think writing an effective email is important for your work?
4. What are the tips and tricks you use to write effective emails?

How to write effective emails?

| Do | Don't |
|---|---|
| Use specific subject lines | Use vague subjects like "Update" |
| Keep language clear and simple | Overuse jargon or acronyms |
| Tailor tone to your stakeholder (formal/informal) | Copy-paste same message for all |
| State actions and deadlines clearly | Bury action items in long paragraphs |
| Proofread before sending | Send emails with typos or unclear structure |

What is *communication*?

A process by which information is exchanged between individuals through a common system of symbols, signs, or behavior (Merriam-Webster)

Three critical elements of communication:

- Ethos
- Pathos
- Logos

ETHOS is your *credibility*

It is the reason people should believe what you're saying. It is built by demonstrating technical expertise, and/or strong levels of integrity and character

PATHOS is making an *emotional connection*

It is the reason people believe that what you're saying will matter to them. It is built by demonstrating attention, active interest, and enthusiasm in your team and collaborators

LOGOS is about *logic* and *reason*

It is strategic thinking, problem solving and analytical skills that make people build logical connections and express them in a clear and compelling way

Communication

Effective communication is a multifaceted skill

The ability to express thoughts, emotions, and ideas clearly and persuasively can open doors, foster meaningful connections, and influence both personal and professional paths

Communication serves as the cornerstone of all meaningful human interactions and include:

-  Verbal
-  Non-Verbal
-  Written
-  Visual

Verbal Communication

Verbal communication involves conveying ideas and information through spoken words. As the cornerstone of *human interaction*, it allows individuals to articulate thoughts, emotions, and concepts clearly and efficiently.

This form of communication is vital in daily life, facilitating collaboration and nurturing relationships.



Example of verbal communication: interpersonal; public; group.

Verbal communication is ideal for face-to-face interactions, team meetings, brainstorming sessions, and situations that require immediate feedback and emotional connection.

Non-Verbal Communication

Non-verbal communication refers to all forms of communication that do not involve spoken or written words.

It includes factors like tone, pitch, and body language, all of which play a crucial role in shaping how messages are understood and interpreted.



Example of non-verbal communication: facial expression; body movement and posture; eye contact; gestures; space.

Non-verbal communication plays a key role in expressing emotions, highlighting important points, and impacting how your message is perceived.

It is especially important in contexts such as negotiations, presentations, and public speaking.

Written Communication

Written communication refers to the transmission of ideas and information through written text. It provides a structured and lasting means of communication, commonly utilized in formal and professional environments.



Example of written communication: email; text messages; memos; social media posts; reports.

Written communication is well-suited for formal reports, documentation, emails, and any context where maintaining a permanent record is crucial.

Visual Communication

Visual communication utilizes images, symbols, and graphics to deliver messages effectively. It plays a crucial role in many different disciplines, and data visualization.



Example of visual communication: infographics; charts and graphs.

Visual communication is highly effective in presentations, sales pitches, data analysis, and any scenario where information must be delivered quickly and leave a lasting impression.

Enhancing Power

- *Verbal communication* strengthens the message by incorporating tone, emotion, and emphasis through speech variations, intonation, and pacing. It enables real-time interaction and feedback, helping to clarify and reinforce the intended meaning.
- *Non-verbal* cues enrich communication by providing insight into the speaker's emotions, intentions, and attitude. They help clarify ambiguity, highlight key points, and enhance audience engagement.
- *Written communication* strengthens the message by ensuring accuracy, structure, and the ability to express complex ideas effectively. It also provides the opportunity for careful editing and refinement to enhance clarity.
- *Visual communication* amplifies the message by making it more engaging, memorable, and easy to understand. It simplifies complex information, enhances retention, and provides visual context that complements both verbal and written communication.

Communication process

- Communication process refers to the steps through which the message is transmitted from one person to another in an understandable manner.
- It is dynamic in nature rather than static.
- Refers to all types of communication: verbal, non-verbal, written and visual.
- Modern models of communication process take into account its interactive, multi-layered and non-linear characteristics.

Models of communication process

Linear model Communication as a one-way process where the sender intentionally transmits a message to the receiver.

Focused on message

Eg. Podcast about licensing.

Interactive model

Communication as a two-way process, in which participants alternate positions, and generate meaning by sending messages and receiving feedback within physical and psychological context.

Focused on interaction

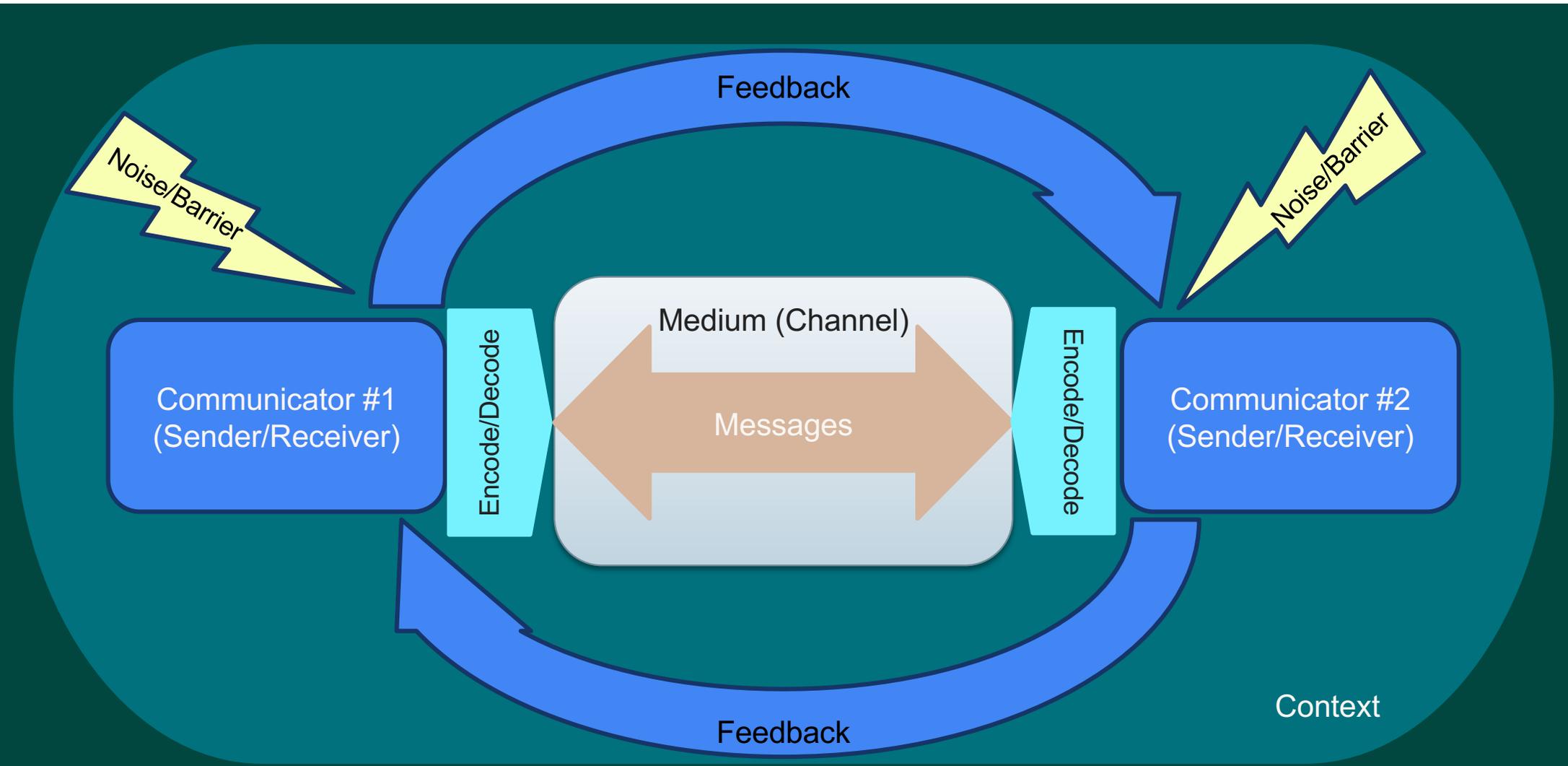
Eg. Exchange of e-mails between KT professional and researcher.

Transactional model

Communication as a process where communicators generate social realities within social, relational, and cultural contexts. Participants are senders and receivers simultaneously.

Focus on relationships, intercultural alliances and engaging to create communities.

Eg. face-to-face conversations between KT team members.



Transactional model of communication process
(Source: KTSS Project Consortium)

Elements of communication process (1)

01

Sender (Communicator #1) - generates the message and conveys it. Eg. KT professional sharing research results with industry partner.

02

Message - the content of communication (idea, information, feeling), which includes both spoken words and non-verbal signals like gestures, facial expressions, a tone of voice. Eg. research findings, greetings.

03

Encoding - converting messages into communication symbols: words, pictures, gestures, symbols, etc. Encoding translates the internal thoughts into language. Eg. translating complex data into understandable presentation.

04

Medium (Channel) - the manner in which the encoded message is transmitted. Eg. e-mail, meeting, call.

Elements of communication process (2)

01

Decoding - translating the encoded message into an effective language, understood by the receiver. Eg. industry partners interpreting research findings.

02

Receiver (Communicator #2) – person for whom the message was sent. Eg. industry partner participating in meeting with researcher.

03

Feedback - reversal of communication in which the receiver expresses his reaction. Ensures that he received and understood the message, fulfilling purpose of communication. Eg. lawyer's opinion about project agreement.

04

Noise/Barriers - the factors that hinder the smooth flow of communication, causing distortion or interference. Barriers of physical, psychological, linguistic/semantic, cultural nature. Eg. scientific jargon, distance, cultural differences.

Effective Communication

In order for the communication to be effective, it has to be intentional and planned. Planning the communications gives the message a purpose, makes sure that it is understood correctly and that the information gets turned into action.

There are multiple strategies on how to make your communications more effective. This module focuses on "The Five W's" and the "SMRC model of communication".

The Five W's

The Five W's are essential in the first steps of planning effective communication. They help to get the communication process on the right track from the beginning and they are dependent on the information that needs to be communicated at the time.

The Five W's are: *Who, When, What, Where* and *Why*.

The Five W's: Who?

Who are you communicating to? Identify your target audience on a concrete level. Use proper language to deliver your message to different audiences, e.g. researchers and investors.

Communicate widely in order to give the receivers local ownership and a chance to influence the process. Open and timely communication builds trust and creates an atmosphere of involvement.

The Five W's: When?

Consider carefully the time and place where you communicate your message with relevant people. Do you need to share the message both internally and externally? If yes, inform the internal stakeholders first and external second.

Do you share the information to people 1:1 or in larger meeting? Should you include discussion or is it more of informative session?

Key communications should also be made as soon as possible after significant events or decisions.

The Five W's: What?

Communicate your message clearly, and think what is the key home message that you want everyone to remember.

When deciding on what to communicate, remember that there might be things that are not certain yet. Part of knowing what to communicate is also knowing what you don't know or what might change. This should be considered as an information that you should communicate as well.

The Five W's: Where?

Choose the most effective channel to get the message across. Depending on the information and situation, this could be an email, press release or a meeting. Keep in mind that sharing knowledge in coffee rooms, corridors etc. is not the most efficient way, since it can distort the message.

Make sure that you have the time to communicate properly and that people know that they are receiving important information. If possible, provide a space for questions and discussion as well.

The Five W's: Why?

What is the reason you want or need to communicate your message? What are your goals? What do others gain from the information?

Understanding the motives and goals behind the message and communication process helps you to better plan your communications in a way that supports both your message and the way that people take it in.

SMCR Model of Communication

- SMRC (Source-Message-Channel-Receiver) Model of communication is a traditional communication framework. The model breaks down communication into four components shown below. Each of the components are vital in the communication process.

| Source | Message | Channel | Receiver |
|--------|---------|---------|----------|
| | | | |

SMCR Model

01

Source: Creates and initiates the communication. Responsible for creating understandable message. The effectiveness of the message largely depends on the sender's abilities and characteristics.

02

Message: The information that the sender wants to convey to the receiver. Without message, there is no communication.

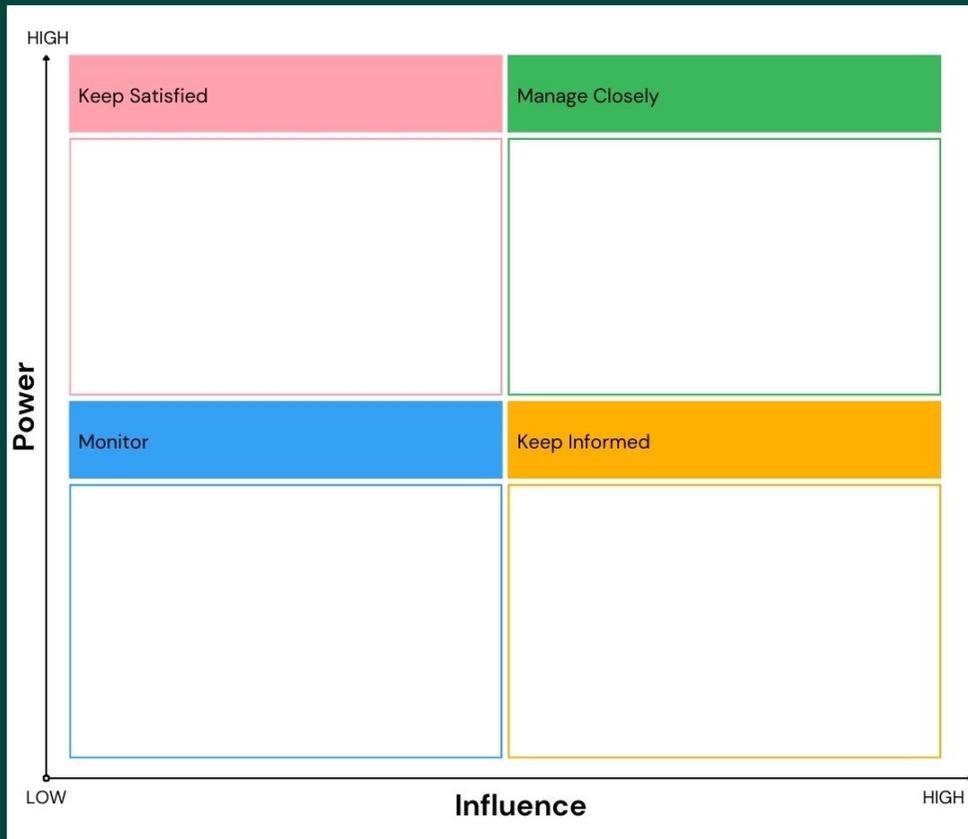
03

Channel: The medium through which the message is transmitted from the source to the receiver. The effectiveness of the communication depends on the choice of the channel.

04

Receiver: Individual or a group that receives the message. Receiver's characteristics are as vital as sender's skills in determining how the message is interpreted. Receiver determines whether the communication has been successful or not.

Stakeholder Map



(Source: KTSS Project Consortium)

A **stakeholder map** is a visual representation of individuals or groups who have an interest in, or are affected by, a project, activity, or decision.

It helps identify and categorize stakeholders based on their **influence, interest, and relationship** to the work.

Mapping stakeholders is the first step toward **strategic, targeted communication**.

KNOWLEDGE TRANSFER STAKEHOLDERS TABLE

| Stakeholder (Backgrounds) | What they care about? (Goals) | How they may misunderstand? | Bridging Tactics |
|------------------------------|----------------------------------|--------------------------------|------------------|
| | | | |
| | | | |
| | | | |
| | | | |

(Source: KTSS Project Consortium)

Researchers: use scientific language, often focused on funding for research and publications

Industry: Potential product development, collaboration terms, longer-term collaboration

Investors: Impact on the market, financial terms, growth potential, building trust

KT team: IP protection and management, legal terms, bridging between stakeholders

Why to use it?

To understand who matters most and how they prefer to be engaged.

To avoid communication gaps or misalignment.

To prioritize efforts and tailor messaging.

How to use it?

List stakeholders (e.g., researchers, investors, licensing teams).

Assess each one's level of interest and influence.

Plot them on a simple 2x2 matrix (High/Low Interest vs. High/Low Influence).

Plan engagement: Decide what to communicate, when, and how often.

Effective stakeholder mapping to bridge the gap between research and application

Facilitate “translation” work between disciplines, ensuring key insights are not lost.

Tailor messages for each group (e.g., simplify language for businesses, focus on impact for funders).

Plan timing and tone of communication (e.g., early involvement for researchers, periodic updates for partners).

Stakeholder maps are living tools—update them as projects evolve or new actors emerge.



Interdisciplinary Communication

Innovation dies in translation — or lack of it. Non-technical stakeholders (investors, users, regulators) are critical.

Some questions to ask yourself:

- What do they already know?
- What do they care about?
- What decisions are they trying to make?

Tip:

Avoid assumptions. A startup investor \neq a medical doctor \neq a policymaker.

Some Tools That Work

Analogies & Metaphors

"Think of it like..." (e.g., AI model = recipe with ingredients and rules)

Narratives

"Let's follow a user through the experience..."

Visuals

Diagrams, process flows, concept maps

Simple Language

Avoid jargon. Use verbs over nouns

Before vs. After Example:

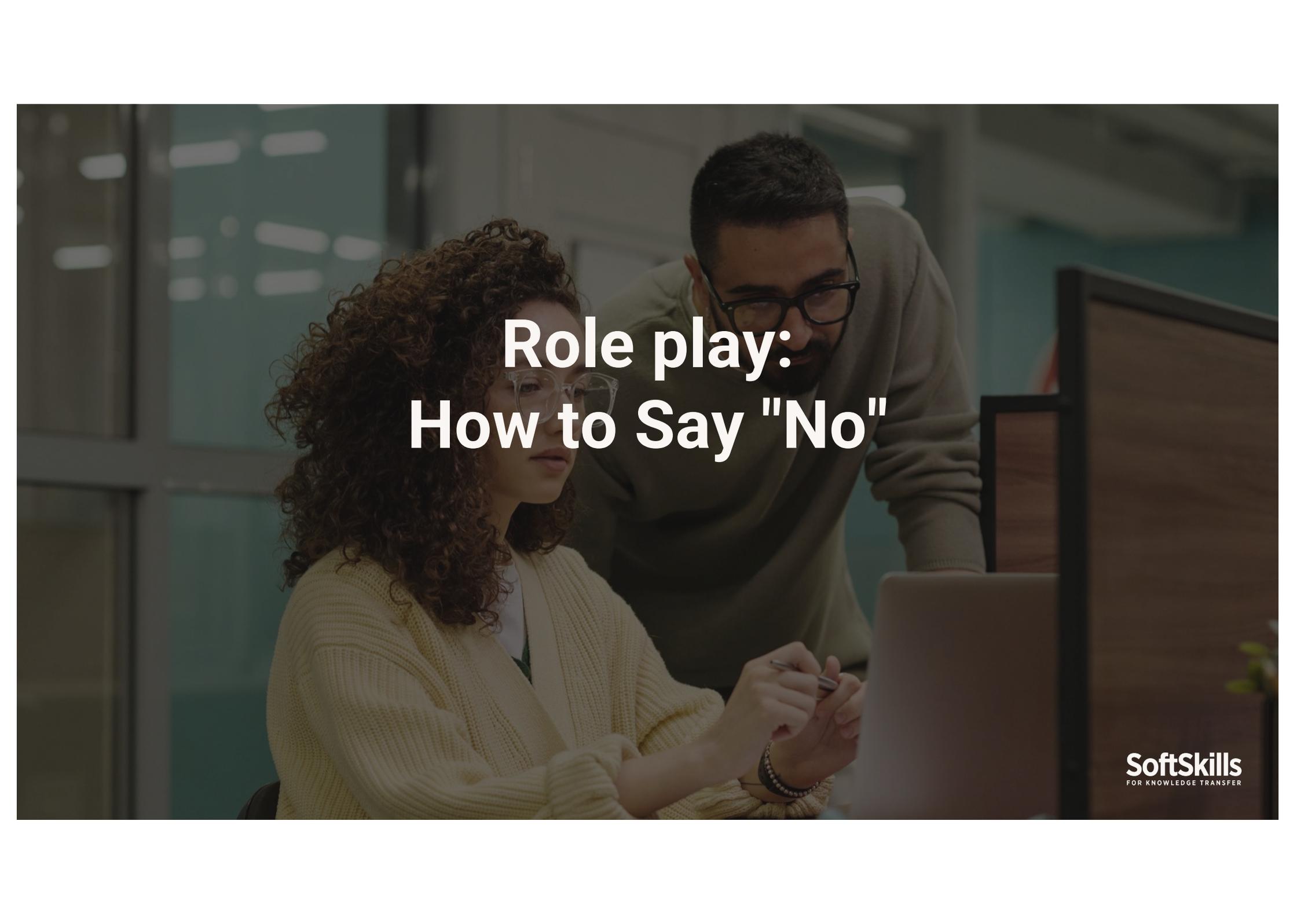
- ✗ "This photonic crystal manipulates light via periodic dielectric modulation."
- ✓ "It's like a tiny maze of mirrors that redirects light in precise ways."

Group Exercise: Translation

You are a part of the knowledge transfer team in the Technology Transfer Office of a renowned university. After exchanging a few emails with a researcher, you asked him/her to fill an Invention Disclosure Form (IDF) about a possible opportunity.

Based on the IDF you received from the researcher, prepare an informal pitch for a deep tech investor who is interested in this domain.

Your pitch will be 1-3 minutes, aiming to attract further collaboration discussions. Other team will provide feedback to your pitch.



Role play: How to Say "No"

Instructions

Split into group of 2 or 3 people: each group has a Requester (researcher), a Responder (KTO), an optional Observer.

Start with the first scenario. The requester try to get a "yes", while the responder has some reasons to say no.

After each role-play, switch roles and repeat with a different scenario.



Scenarios

Round 1

A researcher approaches the KTO excited about a recent lab finding and requests a patent filing. After evaluation, the KTO concludes that the invention lacks novelty and does not meet the criteria for patentability.

- Researcher insists it's "just like" other things that have been patented.
- TTO must say no to filing, and explain why.

Scenarios

Round 2

A researcher applies for proof-of-concept (PoC) funding to develop a prototype. The TTO must decline the request because the project doesn't meet evaluation criteria (e.g., no commercial potential, unclear use case).

- Researcher feels frustrated and says, "But this is the future!"
- TTO must say no to funding, and maintain trust.

Round 3 (optional)

A researcher wants to publish a paper on results tied to an ongoing licensing negotiation. The TTO must say no due to confidentiality and potential risk to IP value.

- Researcher argues it's important for their academic career.
- TTO must hold the line on timing and protection.

Alternative Scenarios

Round 4 (optional)

A researcher sends KTO an urgent request at 6pm, asking to review and edit their grant proposal before submission tomorrow morning — for the third time this month. KTO have other priorities and cannot help tonight.

- Researcher argues it's very important for their academic career and for the university.

Debriefing

Rejector's Perspective

- How did it feel to say no in a professional context?
- Which part of your response worked best? Why?
- Did you feel you were clear and respectful? Would you change anything?

Requester's Perspective

- How did it feel to hear "no"? Did the delivery soften the impact?
- Did the refusal maintain the relationship or create tension?
- What tone or wording made the refusal more acceptable?



How to Say "No"?

There are several core drivers for finding oneself in a situation when "No" has to be delivered and some examples are set out here.

Driver 1 - concrete choices have to be taken and are in the remit of the KTO

Driver 2 - external boundaries do exist which impact on KTO ability to move forward

Driver 3 – realistic and necessary limits need to adhered to

Examples

Limited time ; Limited budget ; Need to Focus ; Need to pick most likely successful projects

- "No we will not file a patent";
- "No you didn't get Proof of Concept Funding"

Dangerous to progress; Need to set boundaries.

- "No we can't license exclusively to them...";
- "No you can't publish until...";
- "No you can't share that it's confidential"

Need to set lower boundaries; Need to meet a standard.

- "No we can't do all that for free";
- "No we can't accept these licensing terms"

Rejection

Why Is It So Hard to Say No?

- Fear of disappointing others
- Fear of missing out (FOMO)
- Pressure to be liked or helpful
- Worry about conflict
- Lack of practice setting boundaries

Key Principles for Saying No

- Be clear, not vague
- Be honest, not overly apologetic
- Be firm, not aggressive
- Be respectful and polite
- Offer alternatives if appropriate

An alternative way to initiate rejection

"How am I supposed to do that?"

This isn't a direct "no," but it signals resistance. It shifts the burden back to the other person without closing the door. You stay cooperative while expressing that the request may be unrealistic. Use this sparingly—overreliance can backfire if it becomes predictable.

Important Note: Cultural Limitations

One Size Doesn't Fit All

- The communication strategies, models, and examples used in this course are primarily drawn from European cultural norms.
- Concepts like assertiveness, direct feedback, eye contact, or open disagreement may not be appropriate or effective in all cultural settings.

Context Matters

- High-context vs. low-context cultures interpret communication cues differently.
- Power distance, hierarchy, and collectivism can significantly impact on how communication is expressed and received.

How to Learn More?

- You are welcome to take our training module "Socio-cultural skills for Knowledge Transfer".

Thank you!



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Communicating with Impact Teaching Toolkit

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| • IDF A Physical Science Zeolite Catalyst | |
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| • IDF C Stretchable Electronics | |
| • Worksheet - KTSS Stakeholder Map | |
| • Slides - Communication Module | |

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Communicating with Impact Syllabus

Duration: Approx. 4 hours

This course introduces some essential communication skills that represent the cornerstone of personal and professional success. Effective communication ensures clarity, fosters collaboration, and strengthens relationships. Whether in organizations, personal interactions, or global networks, communication plays a critical role in achieving goals and driving progress. Communication skills can be broken down into specific aspects of communication.

In this course, verbal, written, and visual communication are considered. Listening skills are covered as well. By considering theories and real-life cases and theories concerning knowledge transfer, the course will enable the participants to learn key strategies and approaches to enhance written communication proficiency, to develop awareness of body language and tone, and understand the fundamental aspects of listening, among others.

The focus on knowledge transfer ensures that learners will be able to apply communication strategies and tools in their professional knowledge transfer activities, in interactions with a range of varying stakeholders: researchers, business partners and peers.

Intended Learning Outcomes (ILOs)

General objective

Learn effective communication strategies tailored to the knowledge transfer sector, including conveying complex technical concepts in an accessible manner to diverse audiences, and mastering the art of clear communication in both written and verbal forms.

Specific ILOs

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FOR KNOWLEDGE TRANSFER

- ILO-1: Crafting clear written messages by rephrasing ambiguous or technical content for different stakeholders
- ILO-2: Applying key communication frameworks, including the transactional model of communication and 5Ws to everyday knowledge transfer work
- ILO-3: Creating stakeholder maps and applying tailored communication strategies for diverse audiences such as researchers, investors, and businesses
- ILO-4: Applying practical techniques for managing difficult conversations, including how to say "no" effectively and empathetically.
- ILO-5: Designing and implementing a personal action plan to improve your communication skills in real-life KT scenarios.

Methods & Materials

Teaching Method(s)

- Group discussions
- Role-playing simulations
- Frontal Lecture

Required Learning Materials (during-course)

- Course slides
- Stakeholder map template for KT processes
- KT Stakeholder Table template

Additional Learning Materials (post-course)

- The Art Of Saying NO: How To Stand Your Ground, Reclaim Your Time And Energy, And Refuse To Be Taken For Granted (Without Feeling Guilty!), Damon Zahariades
- The Article by by Derek Gaunt from Black Swan Group:
<https://www.blackswanltd.com/newsletter/how-to-say-no-in-a-negotiation>

Lesson Plan

| | | |
|--------|--|-----------------------------------|
| 30 min | <p>Introduction & Icebreaker - Trainer introduces the session objectives and participants play an icebreaker game called "2 Truths and a Lie".</p> <p>2 Truths and a Lie: All participants are asked to prepare three statements about themselves—two truths, one lie. Each participant tells those 3 sentences to the rest of the group. The group guesses the false one.</p> <p>Depending on the group size, you can decide to split the classroom into smaller groups. This exercise would work well for up to 7-8 participants per group.</p> <p>Objective: Highlights varied communication experiences and builds engagement.</p> | Group discussion |
| 30 min | <p>The Email: Participants in smaller groups receive a vague or ambiguous email from a researcher about a potential discovery. Participants are asked to rephrase the email clearly. Then each participant shares their version with the rest of the group.</p> <p>They will later discuss the elements of a good email. They are encouraged to share their experiences with the rest of the group.</p> <p><i>Detailed instructions can be found at the next section.</i></p> | Interactive activity & discussion |
| 15 min | Break | - |
| 30 min | <p>Fundamentals of Communication in KT - Trainer introduces theories</p> <ul style="list-style-type: none"> • Three critical elements of communication • Types of communication • Communication process & its elements | Mini-lecture & Q&A |

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FOR KNOWLEDGE TRANSFER

| | | |
|--------|--|-----------------------|
| | <ul style="list-style-type: none">• 5Ws of Communication• Stakeholder Map | |
| 30 min | <p>The Translator Participants are placed in groups of 3 or 4 people. They are given a technical document about a research discovery (IDF). Each group will prepare a 3 min pitch / email to be shared with potential business partners.</p> <p><i>Detailed instructions can be found at the next section.</i></p> | Pitching / presenting |
| 15 min | Break | |
| 45 min | <p>How to Say “No”? Participants are placed in groups of three (KT Professional, Researcher, and an observer). The KT Professional's Role: to explain that the discovery is not suitable for IP protection. The researcher's role: actively respond and ask for additional details to clarify the explanation.</p> <p>The observer notes where breakdowns occur and suggests improvements.</p> <p> Confidential Briefs - How to Say No</p> <p><i>Detailed instructions can be found at the next section.</i></p> | Role-playing |
| 15 min | Feedback & Discussion - Trainer and peers provide feedback on the roleplay activity. Guided questions & follow up discussions | Peer feedback |

Detailed Instructions for Group Activities

The Email

Use **Slide 6** to explain the task to the participants. Split participants into smaller groups (3-4 participants per group). This exercise can be organised in two different ways:

Option 1: Each participant prepares an individual email – they rewrite their own version of the email provided on **Slide 7**. When everybody is ready, each participant reads out their version of the email in the group. They discuss the differences between different versions. As the final step, the debriefing questions are discussed all together.

An example timeline:

| | |
|---------|---|
| 5 min. | Explaining the exercise |
| 7 min. | Time to rewrite the email |
| 6 min. | Reading the emails & brief discussions within the group |
| 12 min. | Discussion in the classroom |

Option 2: Each group prepares one email together – each group rewrites only one version of the email provided on **Slide 7**. When all groups are ready, all letters are read out loud in the classroom. They discuss the differences between different versions. As the final step, the debriefing questions are discussed all together.

An example timeline:

| | |
|---------|-----------------------------|
| 5 min. | Explaining the exercise |
| 12 min. | Time to rewrite the email |
| 3 min. | Reading the emails |
| 10 min. | Discussion in the classroom |

The Translator

There are several versions of Invention Disclosure Forms – each referring to a different technological field - in the course materials folder. Participants are asked to decide which IDF to work on.

When explaining, emphasize that this is an informal pitching without any slides which could be a literal “elevator pitch”. We are not looking for anything perfect. It is about filtering information and translating the IDF into something very simple and relevant for the investor.

An example timeline:

- 5 min. Introduction of the exercise
- 15 min. Preparation for the pitch
- 10 min. Pitching & feedback (3 min. pitching + 2 min. feedback per group)

How to Say “No”?

Use Slide 39 to explain the exercise. There are two alternative ways to run this exercise. Each group should consist of 2 or 3 people.

Option 1 – Improvised roleplaying (recommended)

Don't show the slides 40 – 41 – 42 in the classroom. Instead, give confidential briefs (**you can find the printout versions below**) to participants. They should not see the confidential briefs of their peers.

They will have only 2-3 minutes to prepare themselves to the role. Then they will put themselves into the role that was given to them. They will improvise as requester or responder.

An example timeline:

| | |
|---------|---|
| 5 min. | Introduction of the exercise |
| 20 min. | 2-3 Rounds of Roleplaying (2-3 minutes to prepare + 3-4 min. to roleplaying) |
| 20 min. | Discussion & Debriefing |

Option 2 – Pre-planned roleplaying

Show scenarios on slides 40 – 41 – 42 to everyone. Ask participants to select one scenario and prepare a “play” together. Participants together will discuss how can this situation evolve. When the teams are ready, they play their previously planned roles in front of the other participants.

An example timeline:

| | |
|---------|---|
| 5 min. | Introduction of the exercise |
| 10 min. | Preparation of the Roleplay |
| 10 min. | Playing the scenario in front of the classroom (3-5 minutes per group) |
| 20 min. | Discussions & Debriefing |

Debriefing session: All participants share their experience, give feedback to each other. The instructor explains tactics for “how to say no”.

Scenario 1: A recent lab finding

Role: Researcher

Context:

You've made a promising lab discovery and want it patented. You believe it has strong commercial potential and is similar to other inventions came out of the university that has patented.

You're emotionally invested – this is the culmination of months of work, and you believe this could attract industry interest and funding.

Your Position:

- You think the invention is novel.
- You may be frustrated if your ideas are dismissed too quickly.
- You've seen "less impressive" things get patents.

Your Goals:

- Convince the KTO to file the patent.
- If refused, ask for a second opinion.
- Avoid delays – you're worried about competitors.

Scenario 1: A recent lab finding

Role: Knowledge Transfer Officer

Context:

You're a Knowledge Transfer Officer responsible for evaluating invention disclosures and advising researchers on protection and commercialization. You've assessed the invention of a researcher with legal input and concluded it **lacks novelty** – it doesn't meet patent criteria.

You're aware the researcher may take this personally – it's part of your role to deliver the news constructively.

Your Position:

- Filing would be costly and likely rejected.
- You must explain this clearly but tactfully.
- You value the researcher's work – just not as patentable.

Your Goals:

- Help the researcher accept the decision.
- Maintain a good relationship.
- Offer next steps: publish, improve the idea, or explore non-patent options.

Scenario 2: PoC Funding

Role: Researcher

Context:

You are a leading researcher in your field. You've applied for PoC funding from the University Knowledge Transfer Office to build a prototype based on your recent work. You believe this innovation represents the future of your field. You plan to talk to the KT officer to convince them for a positive decision.

Your Position:

- You're passionate and excited – the positive decision would be great!
- You hope that reviewers understand the idea's potential.
- You see long-term impact, even if short-term applications aren't clear yet.

Your Goals:

- Push back on any potential negative signal.
- Try to change their mind or ask for reconsideration.
- Get advice on how to improve your chances.

Scenario 2: PoC Funding

Role: Knowledge Transfer Officer

Context:

You're a Knowledge Transfer Officer responsible for evaluating the Proof of Concept (PoC) funding applications. You reviewed a recent PoC funding application and, with the evaluation panel, concluded it does not meet key criteria – the commercial potential is unclear, and the use case is not well defined.

Your Position:

- You must stand by the decision.
- You understand the researcher's frustration, but criteria must be applied fairly.
- Your role is to protect the integrity of the fund and maintain trust with researchers.

Your Goals:

- Communicate the rejection clearly and respectfully.
- Help the researcher understand the reasoning.
- Keep the door open for future collaboration or revised proposals.

Scenario 3: Publishing the Paper

Role: Researcher

Context:

You are a leading researcher in your field. You want to publish a paper about your recent research results. These results are linked to an ongoing licensing negotiation handled by the Technology Transfer Office of your university.

Your Position:

- Publishing is critical for your academic career and visibility.
- You believe delaying publication might hurt your progress or recognition.
- You feel the TTO's restrictions are frustrating and slow.

Your Goals:

- Persuade the TTO to allow you to publish now.
- Argue that academic priorities should be considered.
- Seek compromise if possible (e.g., limited disclosure).

Scenario 3: Publishing the Paper

Role: Knowledge Transfer Officer

Context:

You're a Technology Transfer Officer responsible for managing the IP and licensing process. A researcher reaches out to you about publishing the latest research results which are under confidentiality obligations due to active licensing negotiations.

Your Position:

- Publishing now risks weakening the IP and harming licensing potential.
- You must enforce the timing and protection rules strictly.
- Protecting university and researcher interests long-term is your priority.

Your Goals:

- Clearly explain why publication must be delayed.
- Emphasize confidentiality and commercial risk.
- Maintain a good relationship and offer support for future publication timing.

Scenario 4: Last Minute Support

Role: Researcher

Context:

You are working on a major grant proposal with a deadline tomorrow morning. At 6 PM, you urgently emailed the KTO asking for review and editing support – this is the third last-minute request you've made this month.

Your Position:

- You feel this grant is critical for your career progression.
- You believe securing the grant would enhance the university's reputation.
- You expect the KTO to support researchers, even under time pressure.
- You may be frustrated if they refuse, as you feel this is part of their job.

Your Goals:

- Convince the KTO to prioritize your request tonight.
- Appeal to the importance of this grant for both you and the university.
- If refused, push for at least minimal assistance or quick feedback.

Scenario 4: Last Minute Support

Role: Knowledge Transfer Officer

Context:

You received another urgent after-hours request from the same researcher to review a grant proposal due tomorrow. This is their third such request in a month. You have other priorities and cannot work on it tonight.

Your Position:

- You must set boundaries – the KTO cannot provide last-minute editing every time.
- You want to maintain professionalism and avoid damaging the relationship.
- You recognize the grant is important, but it's not feasible to help right now.

Your Goals:

- Say **no** clearly but respectfully.
- Explain why repeated urgent requests are unsustainable.
- Suggest constructive alternatives:
 - Submitting as it is,
 - Planning earlier support for future proposals,
 - Directing to writing workshops or other resources.

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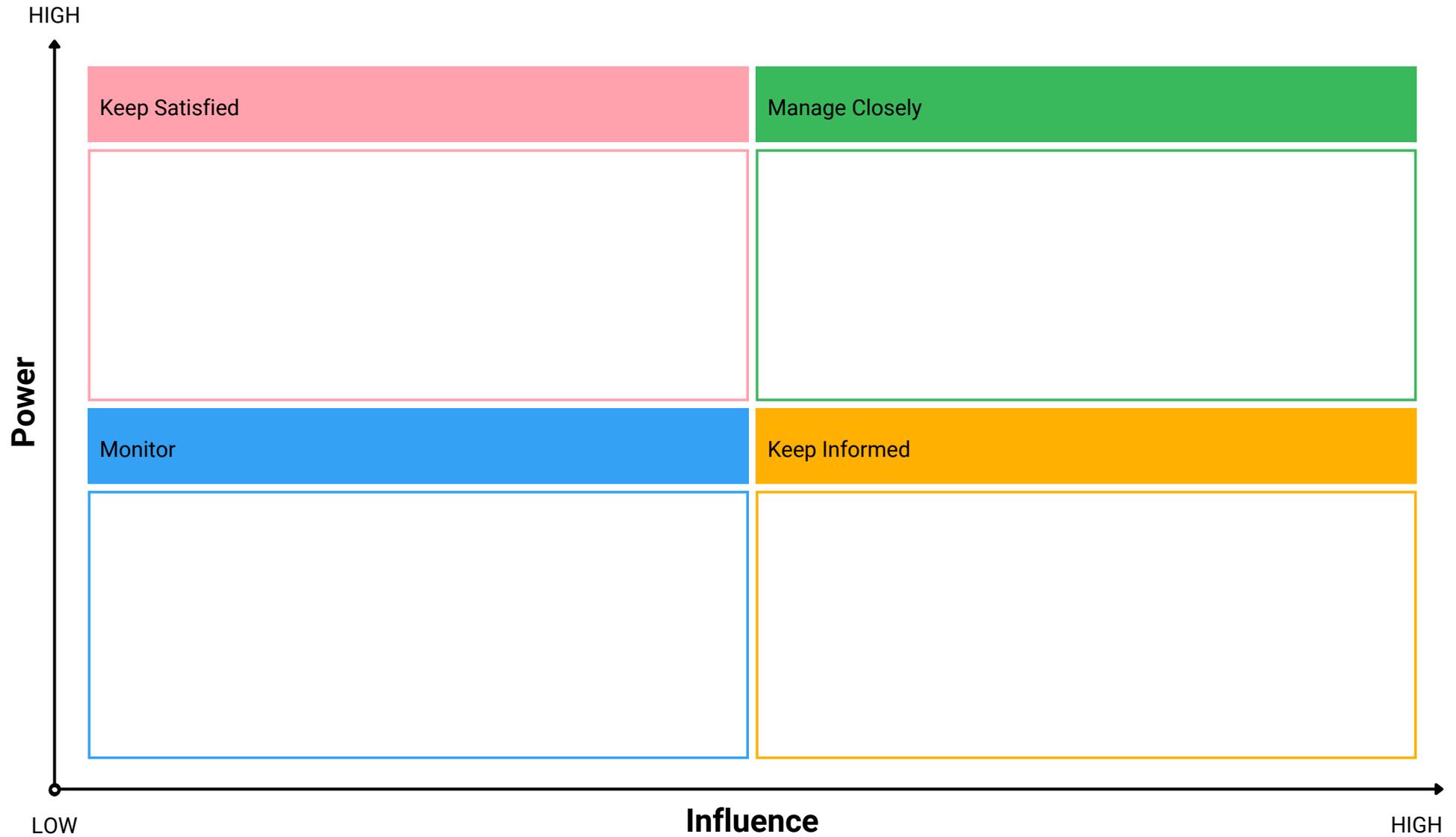


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KNOWLEDGE TRANSFER STAKEHOLDER MAP



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Invention Disclosure Form

1. Title of Invention

Novel method of converting methane to methanol using a Zeolite catalyst.

2. **Inventors** (namely the researchers whose intellectual contribution to the design or discovery can be described as inventive, being different from team members whose contributions applied skills but not inventive input. If more than 3 inventors please append additional sheets)¹

| | | | |
|---------------------------|-------------------------------------|----------------|--|
| Name (Contact person): | Professor Jaroslav Heyrovský | | |
| Employer: | Institute of Physical Chemistry | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % inventive contribution: | 50% | | |

| | | | |
|---------------------------|---------------------------------|----------------|--|
| Name: | Gerty Cori (PhD Student) | | |
| Employer: | Institute of Physical Chemistry | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % inventive contribution: | 50% | | |

3. Other Contributors

These are people with whom you may like to share any acknowledgement or returns in the event of successful valorisation of the invention. They are people whose work contributed to the success of the research but who were not responsible for the inventive spark or design of the research. They can include PhD students, technicians, postdocs or other colleagues whom you believe made a material, non-inventive contribution.

| | | | |
|------------------------|---|----------------|--|
| Name (Contact person): | Mr. Peter Grünberg (Laboratory technician) | | |
| Employer: | Institute of Physical Chemistry | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % contribution: | | | |

4. Description of invention

Please try to answer the following questions.

4.1. What problem does the invention solve?

The invention uses a novel Zeolite catalyst to convert methane to methanol. This can be done at a significantly lower temperature than existing methods (below 250 C) with higher yield (> 50 times compared to existing methods).

The conversion of methane to methanol is a significant area of research due to the potential to transform a readily available greenhouse gas into a valuable chemical feedstock. Methanol can be used as a fuel, a solvent, and a precursor for various other chemicals, making this conversion process industrially attractive.

4.2. Do you know of any similar inventions that exist and if so, how does your invention differ?

The established industrial process also uses catalysts, (see below) but they are different and the temperature needs to be much higher and the current conversion level from existing catalysts is lower.

4.3. Abstract or summary of the invention. Please explain the invention in general terms (max. = 100 words)

The process of catalytic conversion of methane to methanol is often described as a "holy grail of catalysis" due to its potential for efficient energy storage and transportation. These catalysts can be broadly categorized into those inspired by nature (biomimetic) and those synthesized based on specific chemical principles. Metal-organic frameworks (MOFs), metal-exchanged zeolites, and metal oxides have been shown to be among the most promising materials for this conversion.

Our novel Zeolite catalyst is the result of many years of research. It has been shown to significantly lower the temperature needed to carry out the methane conversion process and the conversion ratio is much higher.

4.4. Keywords (for an overview, see the Annex) maximum of five

Zeolite; catalyst; Methane; methanol; conversion.

4.5. Technology Information. Technical description including background, what is new with respect to the state of art, what is the stage of development and further needed improvements (max. = 150 words)

Our technology of direct oxidation of methane into methanol using a cheap oxidant like oxygen, represents the most progressive approach to natural gas utilization. Current alternatives have limited efficiency and typically require cycling of temperatures between 250 °C and 450 °C as well as the help of a water effluent to enable the release of methanol from the active material.

The technology developed is able to significantly improve the efficiency of the methane conversion at much lower temperatures, with methanol directly evolving into gas phase thus eliminating the necessity to use any effluent. The reached level of the methanol production is up to 80 times higher than any currently disclosed alternatives.

Benefits

- High activity in methane selective oxidation at low temperatures
- under isothermal regime
- Release of oxygenate product without need of added effluent
- Highly stable system under cycling procedures
- "Super" dry conditions not required

Stage of development

The novel catalyst has been produced in the lab at a small scale e.g. milligrams.

The technology is currently at TRL4: technology validated in lab.

The purity of the catalyst as produced by the current methods is around 65% and needs to reach 90% for industrial use.

Industrial scale use would require production of Kg.

It would be necessary to demonstrate that the methane conversion rate does not drop below 80% when the process is scaled up.

4.6. Additional Information, please attach all available information, for example a summary of the invention being disclosed (Include photographs, drawings, sketches, or any other descriptive material)

4.7. What products and/or processes do you think could be protected by a patent?

The process/ novel use of the catalyst.

4.8. What are disadvantages to the invention or limitations that needs to be overcome?

It is not proven beyond lab scale. We do not know if there will be problems if it is taken to industrial scale e.g. if the conversion factor will remain the same at the lower temperature.

5. Information on the intellectual property

| MATERIALS | Yes | No | Don't Know |
|--|------------|-----------|-------------------|
| • Have you supplied any material relating to the invention to anyone outside your research group? Please include names of researchers or others outside of your institution. | | X | |
| • If yes, was the material transferred under a Material Transfer Agreement (MTA)? If appropriate, please supply a copy of the MTA or a contact person. | | | |
| • Did you use any materials supplied by other researchers or companies to make your invention? | | X | |
| • If yes, were the materials supplied under an MTA? If appropriate, please supply a copy of the MTA or a contact person. | | | |

When did the idea for the invention first arise? Please indicate who was/were the employer(s)² at the time of the invention

Date: June 2020

Place: Institute of Physical Chemistry

Employer(s): Institute of Physical Chemistry

6. Funding sources

Please list all sources of funding that have contributed to the invention

| Time Period | Source First money stream (University), Second money stream (national funding agencies), Companies, Other sources including EU (please specify) | What was the relation to the inventive step (idea, people, materials, etc.) |
|--------------------|---|--|
| 20020-2021 | National Science Foundation grant for fundamental science | First attempts by Professor Jaroslav Heyrovský to produce the catalyst. |
| 2021-2024 | National Science Foundation PhD Grant | Demonstration of the idea in the lab and refinement of the Zeolite formulation (Heyrovský and Cori). |
| 2024-ongoing | EC ERA PoC Grant | PoC (TRL3-4) further validation of the idea and refinement of the operating conditions (Heyrovský and Cori). |
| 2025-ongoing | Industrial support from Company A. | Scale up demonstration with support from Mr. Peter Grünberg. Further refinement of the parameters. |

² Please indicate if the employer is different from the employer as indicated on page 1.

7. Public disclosures and confidentiality

| | Yes | No |
|---|-----|----|
| <ul style="list-style-type: none"> Has the invention or any part of it been disclosed in a publication, an abstract or any other written materials? If yes, please attach a copy and write the date of the disclosure on the material. <p>Was presented as a technical flier and poster at the 2023 Conference on Synthesized Catalysts in Berlin.</p> | X | |
| <ul style="list-style-type: none"> Will the invention or any part of it be disclosed in a publication, an abstract or any other written materials? If yes, what is the intended date of disclosure?(please be aware that any disclosure may jeopardize the ability to obtain a patent; we advise you to contact the KTO as soon as possible) | | |
| <ul style="list-style-type: none"> Is there a draft manuscript detailing the invention? If yes, please attach a copy. | X | |
| <ul style="list-style-type: none"> Has this draft manuscript been submitted to a journal or publisher? Please provide details of the publishers, dates of submission and whether or not the publication has been accepted. <p>Planned publication in the late December of this year Journal name: Journal of Syn Cat Materials Submission date: in the next 4 weeks Outcome/Status:</p> | X | |
| <ul style="list-style-type: none"> Has there been/ will there be a (poster) presentation or lecture during a public meeting? Executed/ planned disclosure date: <p>See above: Was presented as a technical flier and poster at the 2023 Conference on Synthesized Catalysts in Berlin. See above.</p> | X | |
| <ul style="list-style-type: none"> Has a third person (outside the institution) been approached about the invention? If yes, who was this person and was the information shared in confidence? <p>Company A approached us after the Berlin conference and offered us a small collaborating to explore scale up. Confidentiality is mentioned in the funding agreement.</p> <p>We also approached 3 other companies after the conference because they had expressed some interest but they have not responded. We sent them the technical flier which does not contain any confidential information. See section 8 below.</p> | | |

8. Commercial interest

| | Yes | No |
|--|------------|-----------|
| <ul style="list-style-type: none"> Are you aware of any companies or other users that might be interested in this invention? Do you know of companies or other research groups that could possibly have developed inventions in the same area? If yes, please list names. <p>As above: Company A approached us after the Berlin confidence and offered us a small collaborating grant to explore scale up.</p> <p>We also approached 3 other companies who either make catalysts (Companies B and C) or manufacture methane by an established method (Company D) after the conference because they had expressed some interest but they have not responded.</p> | X | |
| <ul style="list-style-type: none"> Is the invention related to previous sponsored research projects within your department? If yes, please provide details. <p>Only with regard to the ongoing agreement with Company A to try and scale-up the project.</p> | X | |
| <ul style="list-style-type: none"> Do you know of any other past or ongoing collaborations and/or agreements with third parties that may be relevant to this invention? If yes, please provide details. <p>See above. All other research has taken place under research grants.</p> | | |
| | | |

Signature of inventors

| | | |
|------------|-----------|------|
| Print Name | Signature | Date |
| Print Name | Signature | Date |
| Print Name | Signature | Date |

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Invention Disclosure Form

1. Title of Invention

Improved chromatographic method for purification of viruses

2. **Inventors** (namely the researchers whose intellectual contribution to the design or discovery can be described as inventive, being different from team members whose contributions applied skills but not inventive input. If more than 3 inventors please append additional sheets)¹

| | | | |
|---------------------------|-------------------------------|----------------|--|
| Name (Contact person): | Professor Friederike Loeffler | | |
| Employer: | LIV (Leibniz) | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % inventive contribution: | 45% | | |

| | | | |
|---------------------------|--------------------------|----------------|--|
| Name: | Professor Paulina Frosch | | |
| Employer: | IoV (Berlin) | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % inventive contribution: | 45% | | |

3. Other Contributors

These are people with whom you may like to share any acknowledgement or returns in the event of successful valorisation of the invention. They are people whose work contributed to the success of the research but who were not responsible for the inventive spark or design of the research. They can include PhD students, technicians, postdocs or other colleagues whom you believe made a material, non-inventive contribution.

| | | | |
|------------------------|--------------------|----------------|--|
| Name (Contact person): | Martina Beijerinck | | |
| Employer: | NIAID USA | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % contribution: | 10% | | |

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4. Description of invention

Please try to answer the following questions.

4.1. What problem does the invention solve?

The invention is a new method for purification of viruses. This is important as the purification of viruses can be a significant bottleneck in large-scale viral vector production for gene therapy and vaccine development. This is because traditional methods used for protein purification are not always suitable for viruses due to their larger size and different properties, requiring specialized techniques.

4.2. Do you know of any similar inventions that exist and if so, how does your invention differ?

Methods for purifying viruses are known in the prior art, see for example U.S. Pat. No. 4,664,912 which discloses in particular a method for purifying rabies virus by zone centrifugation in a sucrose gradient. However, such a method has the drawback of being difficult to automate; in addition, a prior inactivation step is necessary, which may lead to interactions between the virus and the cellular DNA which then make the step for removal of this DNA more difficult. The disclosed invention is a novel method for purifying viruses in very high yield which is easy to automate.

4.3. Abstract or summary of the invention. Please explain the invention in general terms (max. = 100 words)

A method for purifying viruses from a cell line culture by chromatography, comprising an anion exchange chromatography step followed by a cation exchange chromatography step and optionally a metal-binding affinity chromatography step. The method is particularly suitable for producing viruses for use in vaccines.

4.4. Keywords (for an overview, see the Annex) maximum of five

Virus; Purification; Chromatographic

4.5. Technology Information. Technical description including background, what is new with respect to the state of art, what is the stage of development and further needed improvements (max. = 150 words)

The invention relates to the field of purification of viruses, and in particular the purification of viruses obtained by culturing on cell lines.

Harvests of viruses obtained from culturing on cell lines such as Vero cells contain not only the desired viruses but also proteins and DNA originating from the culture cells. However, when the viruses are intended for certain uses, such as the manufacture of vaccines, it is essential for them to be as pure as possible. This is because standards exist which limit, to 100·10⁻¹² g/vaccinal dose, the maximum authorized amount of cellular DNA in vaccines comprising products obtained from continuous and heteroploid cell lines.

The new method consists of in separating by ion-exchange chromatography the viruses from the cell proteins and DNA originating from the culture, characterized in that it comprises at least one step of anion-exchange chromatography and one step of cation-exchange chromatography.

The major difference compared to existing methods is the inversion of the order of cation-exchange chromatography and anion-exchange chromatography.

The invention is currently at TRL3 (PoC) having been demonstrated in the lab.

It is now important to carry our further R&D to optimise the purification yields by reducing the amounts of residual DNA to a minimum and optimising the pH of the chromatography steps.

4.6. Additional Information, please attach all available information, for example a summary of the invention being disclosed (Include photographs, drawings, sketches, or any other descriptive material)

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4.7. What products and/or processes do you think could be protected by a patent?

We believe that the process may be patentable.

4.8. What are disadvantages to the invention or limitations that needs to be overcome?

The process itself does not appear to have any inherently disadvantages, but it will require a technology adopter to make significant changes to their existing processes e.g. their production lines. This may require significant investment in new equipment that is not currently commercially available because it is not the present established approach.

5. Information on the intellectual property

| MATERIALS | Yes | No | Don't Know |
|--|------------|-----------|-------------------|
| <ul style="list-style-type: none">Have you supplied any material relating to the invention to anyone outside your research group? Please include names of researchers or others outside of your institution. | | X | |
| <ul style="list-style-type: none">If yes, was the material transferred under a Material Transfer Agreement (MTA)? If appropriate, please supply a copy of the MTA or a contact person. | | | |
| <ul style="list-style-type: none">Did you use any materials supplied by other researchers or companies to make your invention?If yes, were the materials supplied under an MTA? If appropriate, please supply a copy of the MTA or a contact person. <p>We have made use of continuous and heteroploid cell lines. These were supplied under an MTA from the NIH USA.</p> | X | | |

When did the idea for the invention first arise? Please indicate who was/were the employer(s)² at the time of the invention

Date: January 2023

The idea came from a discussion between Professor Friederike Loeffler LIV (Leibniz) and Professor Paulina Frosch IoV (Berlin) when the latter was attending a symposium at LIV.

Place: LIV (Leibniz)

Employer(s): LIV and IoV.

² Please indicate if the employer is different from the employer as indicated on page 1.

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6. Funding sources

Please list all sources of funding that have contributed to the invention

| Time Period | Source First money stream (University), Second money stream (national funding agencies), Companies, Other sources including EU (please specify) | What was the relation to the inventive step (idea, people, materials, etc.) |
|--------------------|---|--|
| 06.2023-12.2023 | IoV investigator grant | Initial test of the invention effect (Loeffler and Frosch) |
| 03.2024-03.2025 | LIV Collaborative research grant | Systematic investigation of effect of parameters on yield (Loeffler and Frosch with discussions involving Beijerinck). |
| | | |
| | | |

7. Public disclosures and confidentiality

| | Yes | No |
|--|------------|-----------|
| <ul style="list-style-type: none"> Has the invention or any part of it been disclosed in a publication, an abstract or any other written materials? If yes, please attach a copy and write the date of the disclosure on the material. Will the invention or any part of it be disclosed in a publication, an abstract or any other written materials? If yes, what is the intended date of disclosure?(please be aware that any disclosure may jeopardize the ability to obtain a patent; we advise you to contact the KTO as soon as possible) <p>The idea for the invention was partially disclosed in the research proposal for funding for the IoV investigator grant (2023) and LIV Collaborative research grant (2024). See above. The abstracts for both projects have been subsequently published.</p> <p>Intended disclosure date:</p> | | X |
| <ul style="list-style-type: none"> Is there a draft manuscript detailing the invention? If yes, please attach a copy. | X | |
| <ul style="list-style-type: none"> Has this draft manuscript been submitted to a journal or publisher? Please provide details of the publishers, dates of submission and whether or not the publication has been accepted. <p>Journal name: Viruses Submission date: 6 weeks ago Outcome/Status: Pending.</p> | | |
| <ul style="list-style-type: none"> Has there been a (poster) presentation or lecture during a public meeting? <p>There was a discussion about the idea at the symposium at LIV in 2023 but this was not considered to be a public event.</p> <ul style="list-style-type: none"> Will there be a (poster) presentation or lecture during a public meeting? <p>Not planned Intended disclosure date:</p> | X | |

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| | | |
|--|---|--|
| <ul style="list-style-type: none"> Has a third person (outside the institution) been approached about the invention? If yes, who was this person and was the information shared in confidence? Professor Beijerinck (NIAID USA) was approached for discussion and collaboration and she has subsequently discussed the idea with her Patenting unit. | X | |
|--|---|--|

8. Commercial interest

| | Yes | No |
|---|-----|----|
| <ul style="list-style-type: none"> Are you aware of any companies or other users that might be interested in this invention? Do you know of companies or other research groups that could possibly have developed inventions in the same area? If yes, please list names. Pasteur Merieux Serum et Vaccines SA hold patent rights in this field. Key players in this market include established pharmaceutical companies, specialized viral vector manufacturers, and contract development and manufacturing organizations (CDMOs). We have not yet approached them but the following may be interested: Merk, Lonza, Thermo Fisher Sceintific, Catalent and Oxford Biomedica. | | |
| <ul style="list-style-type: none"> Is the invention related to previous sponsored research projects within your department? If yes, please provide details. Do you know of any other past or ongoing collaborations and/or agreements with third parties that may be relevant to this invention? If yes, please provide details. | | X |
| | | |

9. Signature of inventors

Print Name

Signature

Date

Print Name

Signature

Date

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CONFIDENTIAL

Invention Disclosure Form

1. Title of Invention

Stretchable Electronics

2. **Inventors** (namely the researchers whose intellectual contribution to the design or discovery can be described as inventive, being different from team members whose contributions applied skills but not inventive input. If more than 3 inventors please append additional sheets)¹

| | | | |
|---------------------------|--------------------------|----------------|--|
| Name (Contact person): | Professor Esticar | | |
| Employer: | University of X Portugal | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % inventive contribution: | 100% | | |

| | | | |
|---------------------------|--|----------------|--|
| Name: | | | |
| Employer: | | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % inventive contribution: | | | |

3. Other Contributors

These are people with whom you may like to share any acknowledgement or returns in the event of successful valorisation of the invention. They are people whose work contributed to the success of the research but who were not responsible for the inventive spark or design of the research. They can include PhD students, technicians, postdocs or other colleagues whom you believe made a material, non-inventive contribution.

| | | | |
|------------------------|--|----------------|--|
| Name (Contact person): | | | |
| Employer: | | | |
| Research Group: | | | |
| Division: | | Work address*: | |
| Work Phone: | | | |
| Mobile Phone: | | | |
| Work Fax: | | | |
| Work E-mail: | | | |
| % contribution: | | | |

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4. Description of invention

Please try to answer the following questions.

4.1. What problem does the invention solve?

Traditional rigid electronics are unable to bend, twist, and stretch without breaking. This severely limits their use. They are also difficult to recycle.

We have developed a novel material composition for printing soft and stretchable electronics at room temperature. This facilitates fabrication of stretchable circuits. The new method allows us to print these circuits at room temperature without the need for thermal sintering, which makes it compatible, with most of the heat sensitive materials.

In addition, we have developed a method that allows integration of microchips into these printed circuits, and subsequent recycling. The electronic circuits can be printed and then subjected to stretching without degradation of performance.

Overall these two technologies contribute toward scalable fabrication of ultrathin stretchable circuits, with applications in wearable biomonitoring, digital health, IoT, and novel generation of energy harvesting films, and displays.

4.2. Do you know of any similar inventions that exist and if so, how does your invention differ?

Stretchable electronics have been under development for some years. However, existing methods for fabrication of stretchable electronics (e.g., conductive elastomers, wavy circuits, EGaln microfluidics, etc.), tend to be complex, and costly.

Our approach permits scalable fabrication of very resilient stretchable circuits, using low-cost printing techniques. In addition, the printed ink does not require high temperature sintering and is conductive immediately after printing. This is made possible by a novel BiPhasic Composite, which is an alloy of Silver and Eutectic Gallium Indium Liquid Metal (EGaln).

Unlike other approaches for fabrication of stretchable electronics that require manual fabrication steps, this technique allows for the first-time direct printing of stretchable circuits.

4.3. Abstract or summary of the invention. Please explain the invention in general terms (max. = 100 words)

Our invention is a method for obtaining a flexible printed circuit with a solid-state electric or electronic component. This consists of printing an electric circuit with a conductive flexible polymer-based ink over a polymeric substrate in the solid state, wherein both polymers in the ink and the substrate are reversible solid-gel phase transition polymers; placing the component over the substrate and over the electric circuit; applying an external stimulus that results in a solid to gel transition of the polymeric substrate and ink, such that the component penetrates into the softened substrate, establishing an electrical contact of the component with the printed circuit.

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4.4. Keywords (for an overview, see the Annex) maximum of five
flexible printed circuit; conductive flexible polymer;

4.5. Technology Information. Technical description including background, what is new with respect to the state of art, what is the stage of development and further needed improvements (max. = 150 words)

SotA

Methods for fabrication of stretchable circuits have advanced rapidly, but integration of microchips into these circuits remains the biggest challenge of the field, and a main obstacle against scalable fabrication.

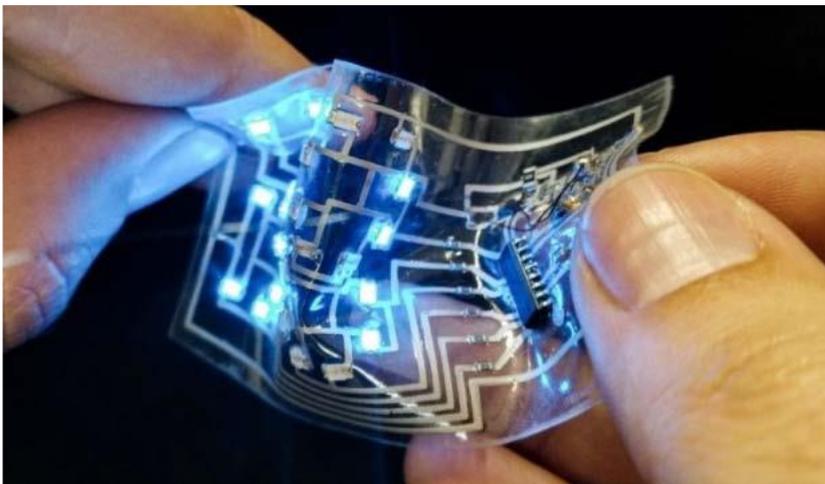
Advances

We have devised a method for fabrication of microchip integrated ultra-stretchable circuits that is able to withstand >600% of strain, over 5x higher than previously reported techniques.

Stage of development

Several proof of concept applications have been developed, and demonstrated that use the process. These includes prototypes of circuits for biostickers for health monitoring, wearable e-textile, printed and stretchable electronic stickers for Human Machine Interfaces, IoT and IoMT devices, Printed Antennas, Printed Batteries, and Supercapacitors. It has been as well demonstrated that the circuits can be recycled after their use, and all components and ink materials can be recovered.

4.6. Additional Information, please attach all available information, for example a summary of the invention being disclosed (Include photographs, drawings, sketches, or any other descriptive material)



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4.7. What products and/or processes do you think could be protected by a patent?

We think that we may be able to protect 2 distinct inventions:

1. Fabrication of complex soft-matter circuits in just two steps:
 - i) Digital Printing through a consyctive, stretchable, sinter-free ink, and
 - ii) Chemical Vapor Exposure for simultaneous a. Microchip Integration, b. Microcrack Healing (thus leading to better mechanical performance), and c. autonomous encapsulation without the need for deposition of other materials.
2. The process for recycling of the printed circuits.

4.8. What are disadvantages to the invention or limitations that needs to be overcome?

At the moment we do not see any major problems – the technology is very well developed and working well. We have taken care not to disclose information publically. However, we are not sure how best to enter what is a very broad market e.g. via company who makes specialised inks or to an end user e.g. a company manufacturing smart clothing or medical implants.

5. Information on the intellectual property

| MATERIALS | Yes | No | Don't Know |
|--|--------------------------|-------------------------------------|--------------------------|
| <ul style="list-style-type: none"> • Have you supplied any material relating to the invention to anyone outside your research group? Please include names of researchers or others outside of your institution. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <ul style="list-style-type: none"> • If yes, was the material transferred under a Material Transfer Agreement (MTA)? If appropriate, please supply a copy of the MTA or a contact person. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <ul style="list-style-type: none"> • Did you use any materials supplied by other researchers or companies to make your invention? • If yes, were the materials supplied under an MTA? If appropriate, please supply a copy of the MTA or a contact person. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

When did the idea for the invention first arise? Please indicate who was/were the employer(s)² at the time of the invention

Date: 2017

Place: ISCTE

Employer(s): ISCTE

6. Funding sources

Please list all sources of funding that have contributed to the invention

| Time Period | Source First money stream (University), Second money stream (national funding agencies), Companies, Other sources including EU (please specify) | What was the relation to the inventive step (idea, people, materials, etc.) |
|-------------|--|---|
| 2017-ongoig | National research grants (FCT) and university internal funding. | All developed under this funding. |

7. Public disclosures and confidentiality

| | Yes | No |
|--|--------------------------|-------------------------------------|
| <ul style="list-style-type: none"> • Has the invention or any part of it been disclosed in a publication, an abstract or any other written materials? If yes, please attach a | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

² Please indicate if the employer is different from the employer as indicated on page 1.

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| | | |
|--|---|---|
| <p>copy and write the date of the disclosure on the material.</p> <ul style="list-style-type: none"> Will the invention or any part of it be disclosed in a publication, an abstract or any other written materials? If yes, what is the intended date of disclosure?(please be aware that any disclosure may jeopardize the ability to obtain a patent; we advise you to contact the KTO as soon as possible) <p>Intended disclosure date:</p> | | |
| <ul style="list-style-type: none"> Is there a draft manuscript detailing the invention? If yes, please attach a copy. | | X |
| <ul style="list-style-type: none"> Has this draft manuscript been submitted to a journal or publisher? Please provide details of the publishers, dates of submission and whether or not the publication has been accepted. <p>Planned: Journal name: ACS Applied Materials & Interfaces Submission date: under negotiation to coordinate with a patent applications. Outcome/Status: N/A</p> | X | |
| <ul style="list-style-type: none"> Has there been a (poster) presentation or lecture during a public meeting? Will there be a (poster) presentation or lecture during a public meeting? <p>Intended disclosure date:</p> | | X |
| <ul style="list-style-type: none"> Has a third person (outside the institution) been approached about the invention? If yes, who was this person and was the information shared in confidence? | | X |

8. Commercial interest

| | Yes | No |
|--|-----|----|
| <ul style="list-style-type: none"> Are you aware of any companies or other users that might be interested in this invention? Do you know of companies or other research groups that could possibly have developed inventions in the same area? If yes, please list names. <p>The market for this invention is very broad. We are not sure where to start e.g.; with an end user namely a company manufacturing smart clothing or medical implants (LG, Samsung, Xiaomi or even Zara to name just a few) or with a company who would make the conductive ink e.g. DuPont.</p> | | |
| <ul style="list-style-type: none"> Is the invention related to previous sponsored research projects within your department? If yes, please provide details. Do you know of any other past or ongoing collaborations and/or agreements with third parties that may be relevant to this invention? If yes, please provide details. | | X |
| | | |

9. Signature of inventors

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Signature

Print Name

Date

Print Name

Signature

Date

Print Name

Signature

Date