



Yanina Ledovaya

# **THREE WORDS TO REMEMBER WHEN WORKING WITH PEOPLE'S MOTIVATION AND PRODUCTIVITY:**

autonomy

competence

relatedness to others

## THREE WORDS TO REMEMBER WHEN WORKING WITH PEOPLE'S MOTIVATION AND PRODUCTIVITY:

autonomy

competence

relatedness to others



**It's not three words, it's five**

*Sandro Botticelli – Self-portrait*

# WE ARE EXPERTS IN HOW PEOPLE ARE FUNCTIONING



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# IMPROVING PRODUCTIVITY IS **CRUCIAL** FOR BUSINESS

Raise your hand if you are...

**developer**

**manager of developers**

**manager of managers**

Developer productivity  
is so hard to measure



*Auguste Rodin  
– The Thinker*

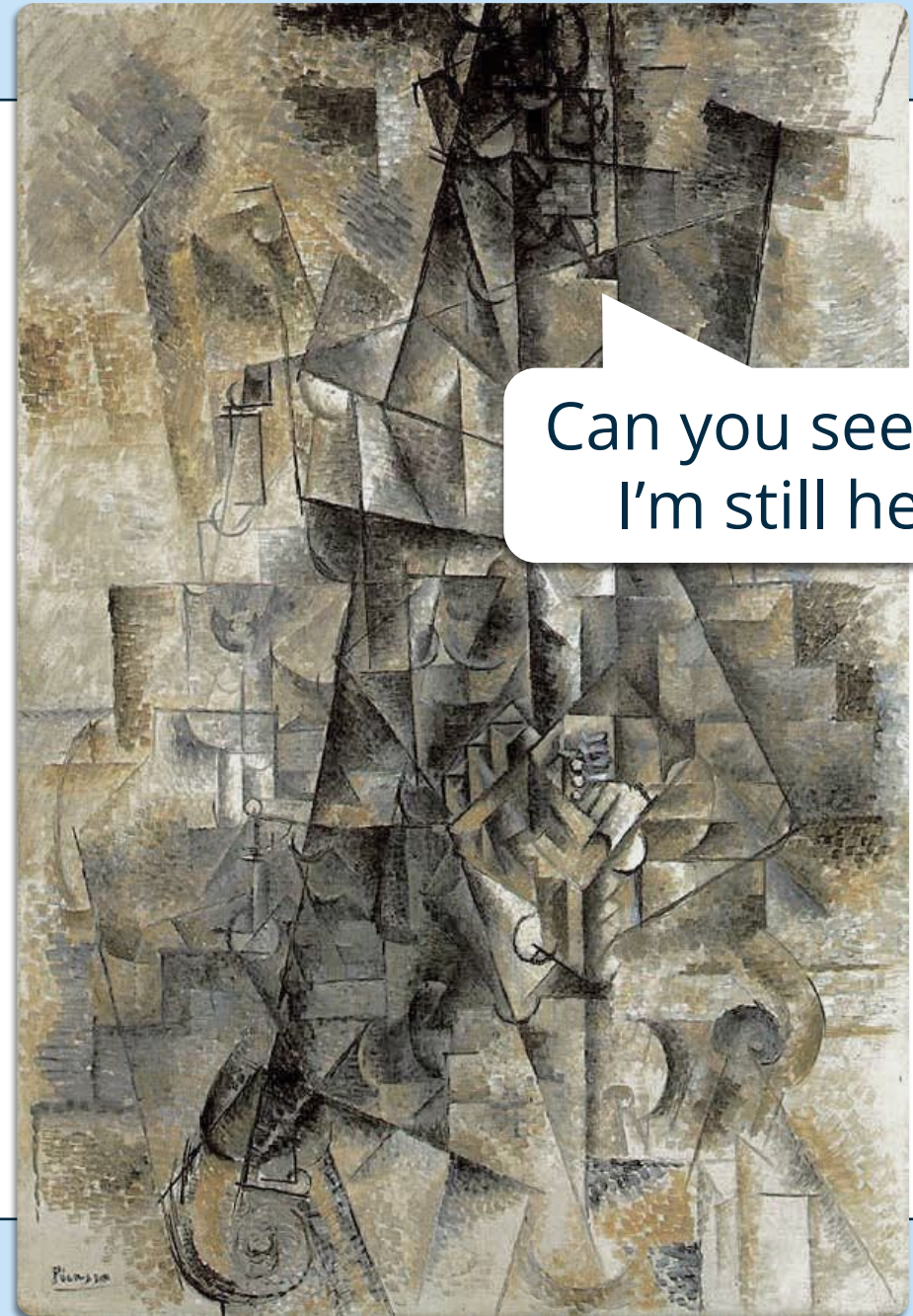
The idea of a developer  
as a **human being**  
is often missing

*Pablo Picasso – Accordionist*



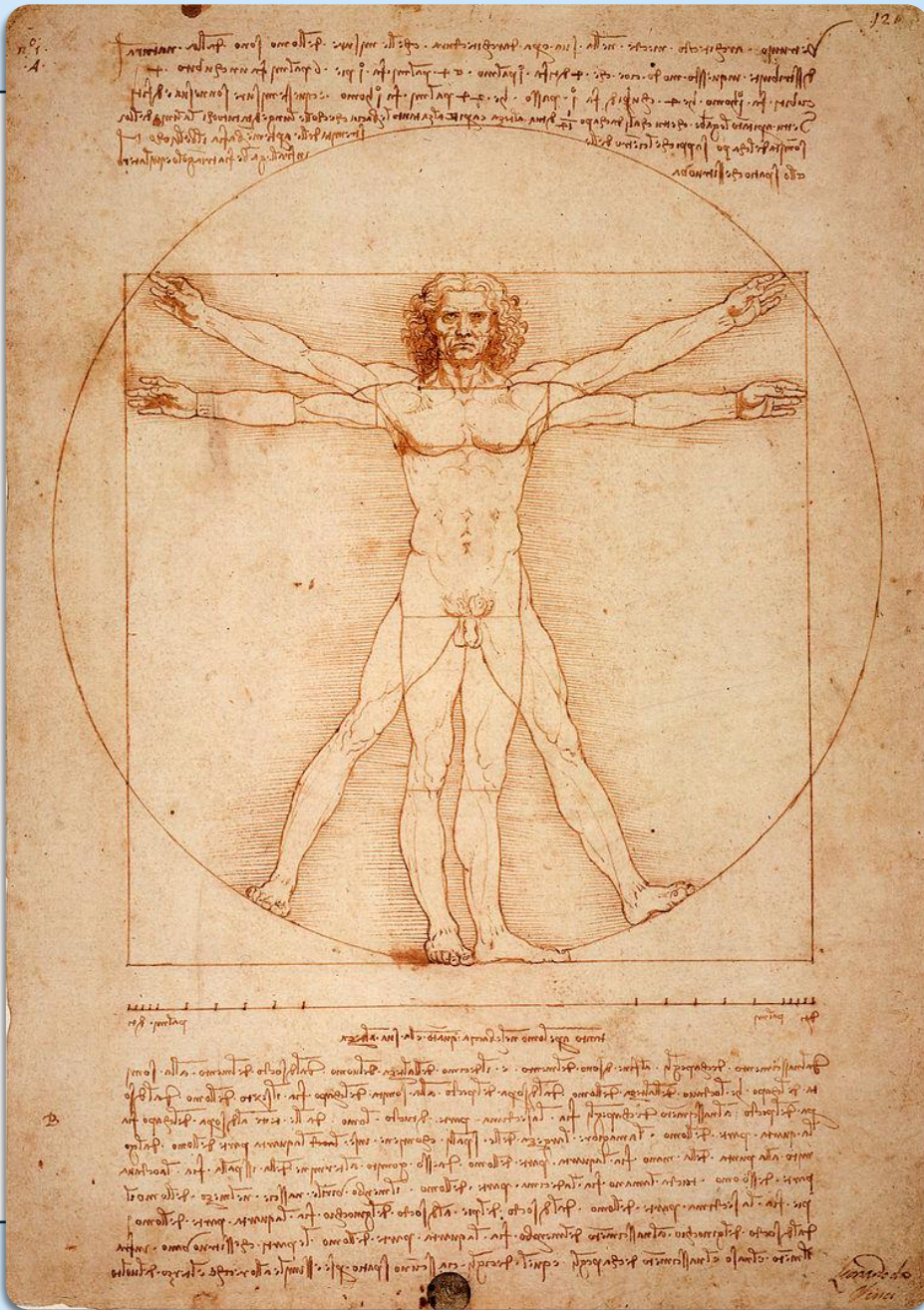
The idea of a developer  
as a **human being**  
is often missing

*Pablo Picasso – Accordionist*



Can you see me?  
I'm still here

PRODUCTIVE HUMANS  
ARE **MOTIVATED** HUMANS



## What **drives** human **motivation**?

*Leonardo da Vinci – The Vitruvian Man*

# Our plan for today

Theory

Application

AI

Takeaway

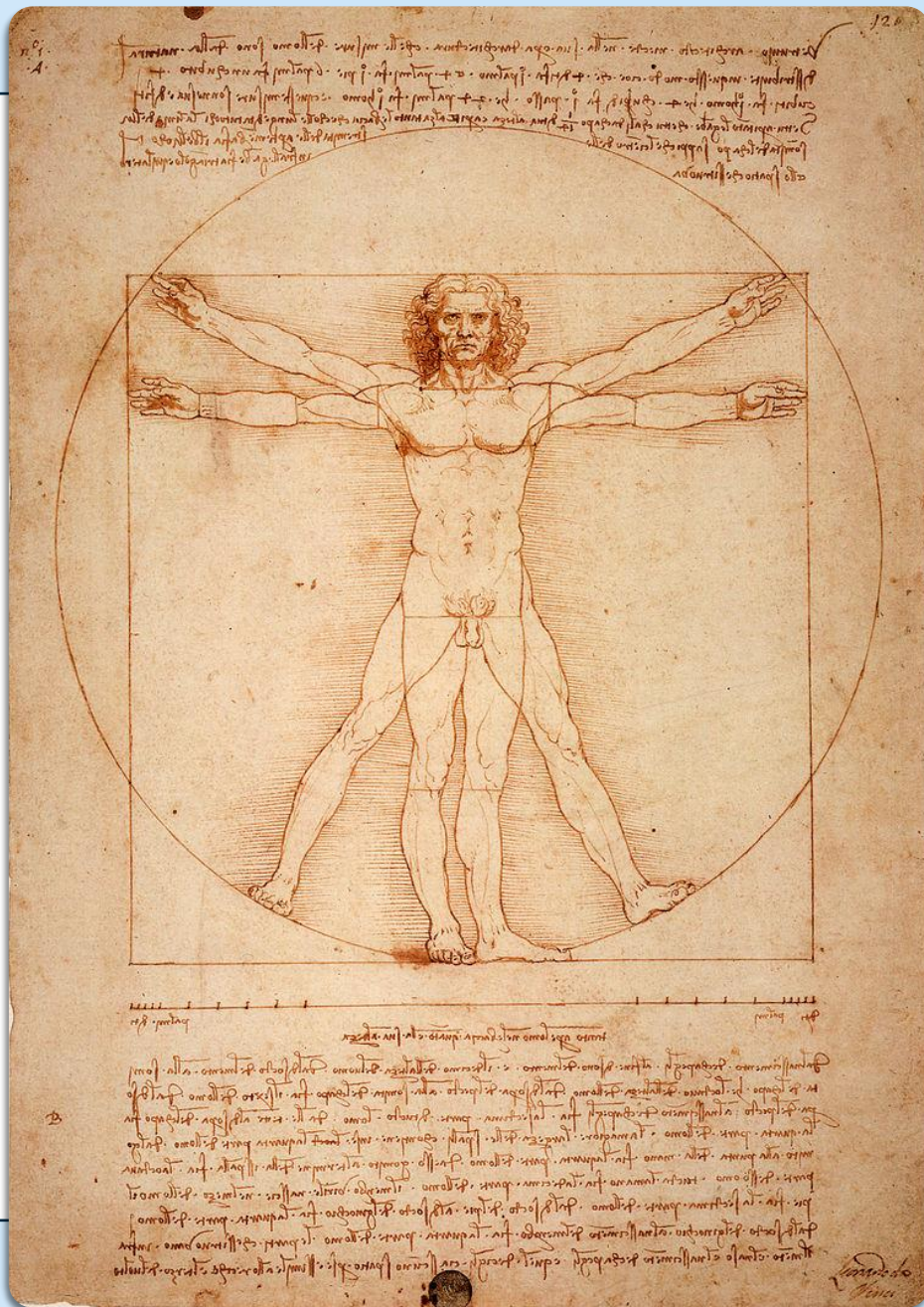
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**Theory**

Application

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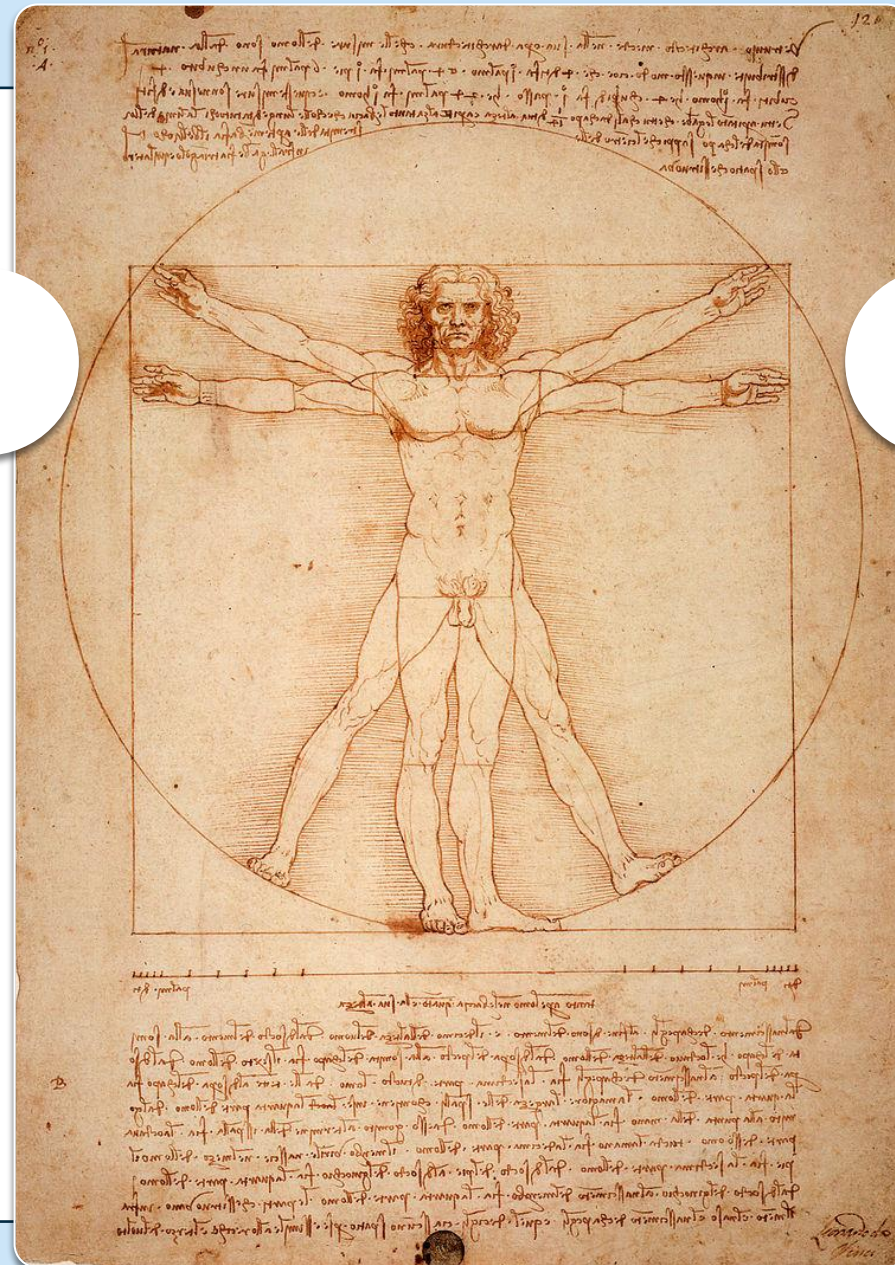
Takeaway



Why people  
do what they do?

*Leonardo da Vinci – The Vitruvian Man*

Extrinsic motivation



Intrinsic motivation

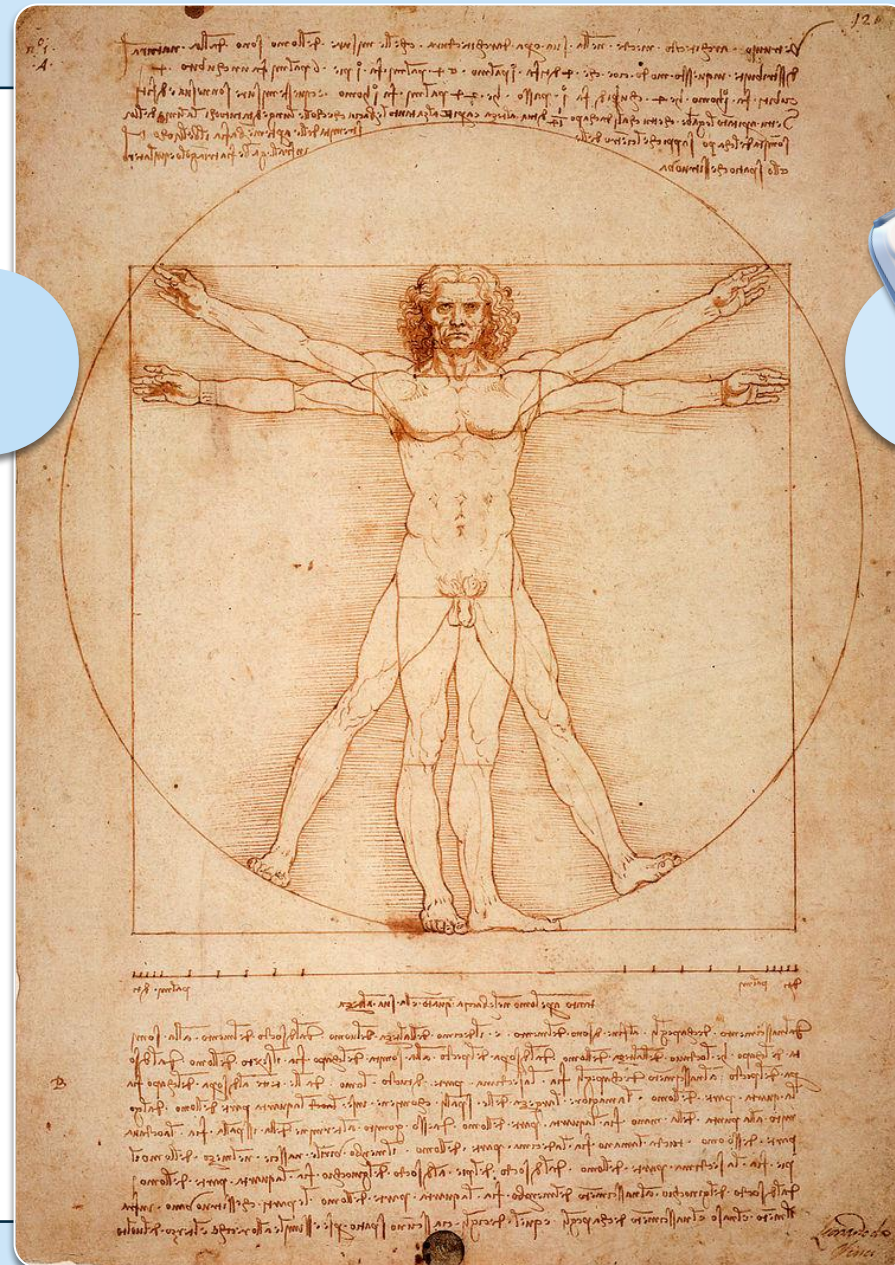
Leonardo da Vinci – The Vitruvian Man



## Extrinsic motivation



## Intrinsic motivation



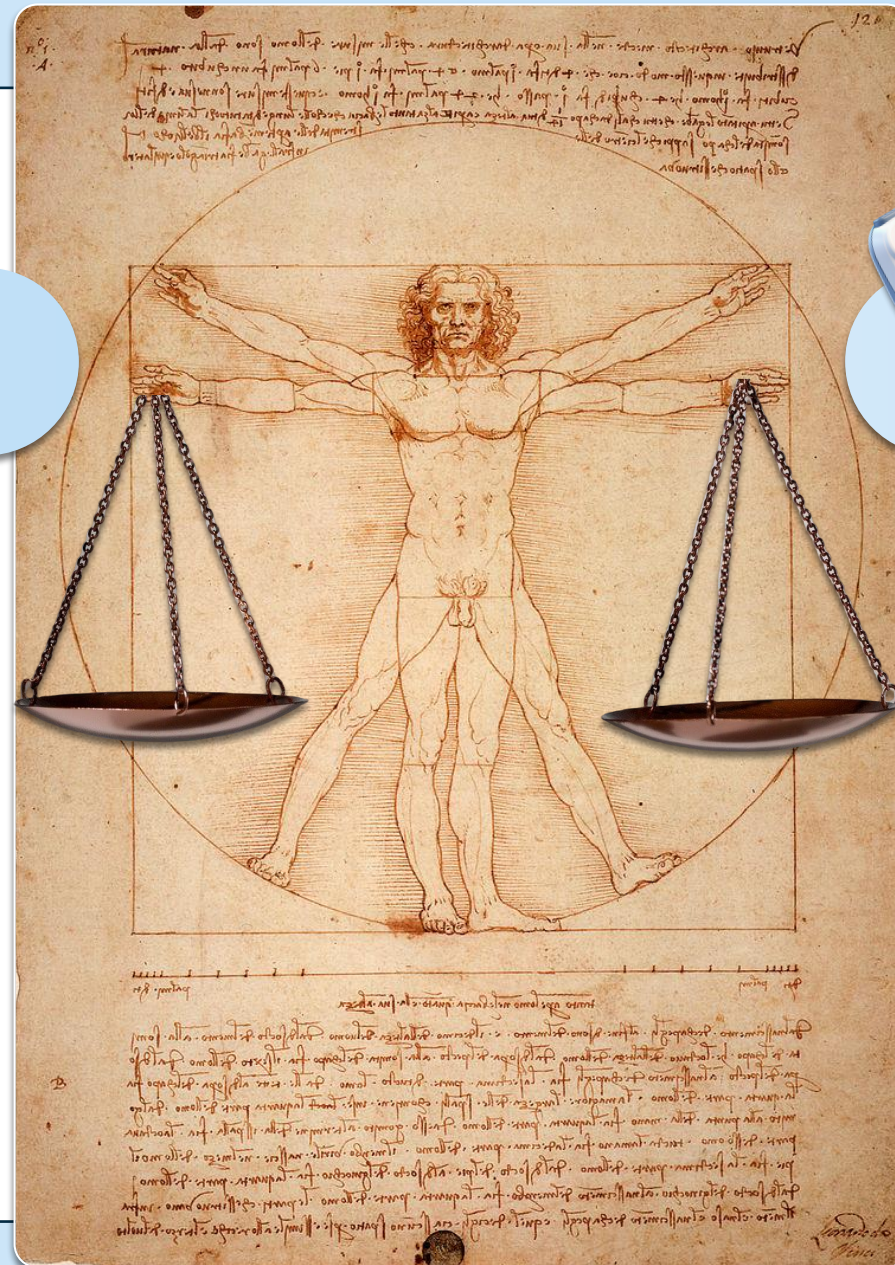
Leonardo da Vinci – The Vitruvian Man



## Extrinsic motivation



## Intrinsic motivation



Leonardo da Vinci – The Vitruvian Man

# Intrinsic motivation



## Intrinsic motivation

- 1 autonomy
- 2 competence
- 3 relatedness to others

## Intrinsic motivation

It is an axiom – all people have basic psychological needs

**3 basic  
psychological  
needs**

*Deci, Ryan, 1985*

**1**

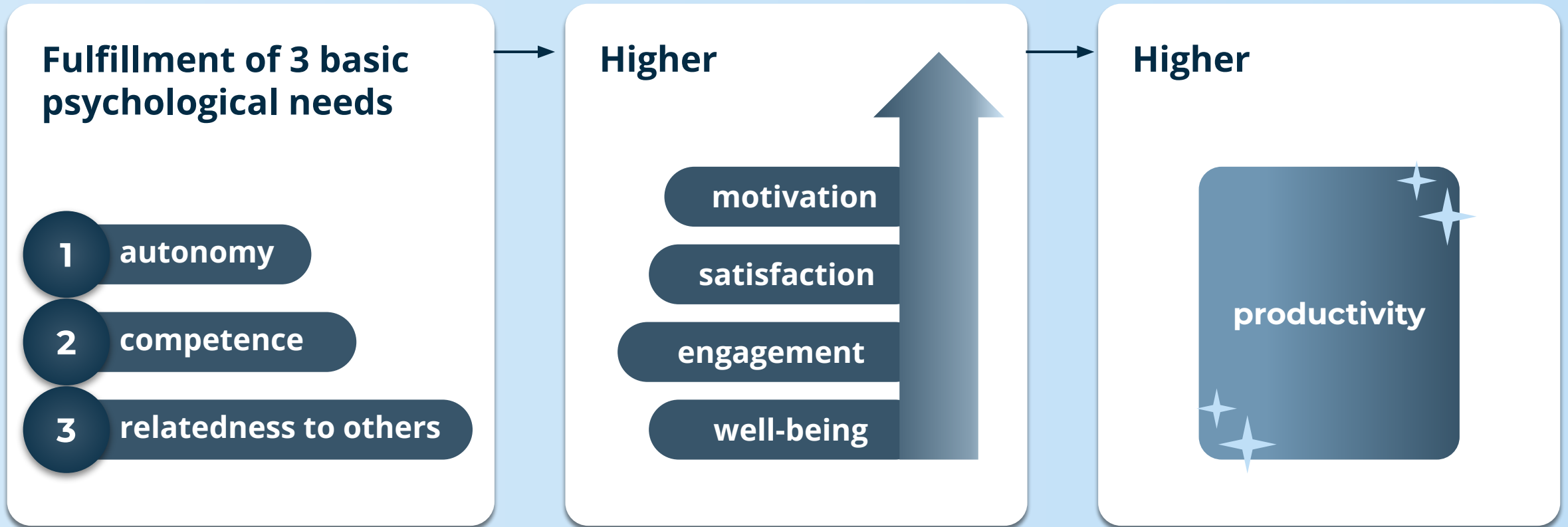
**autonomy**

**2**

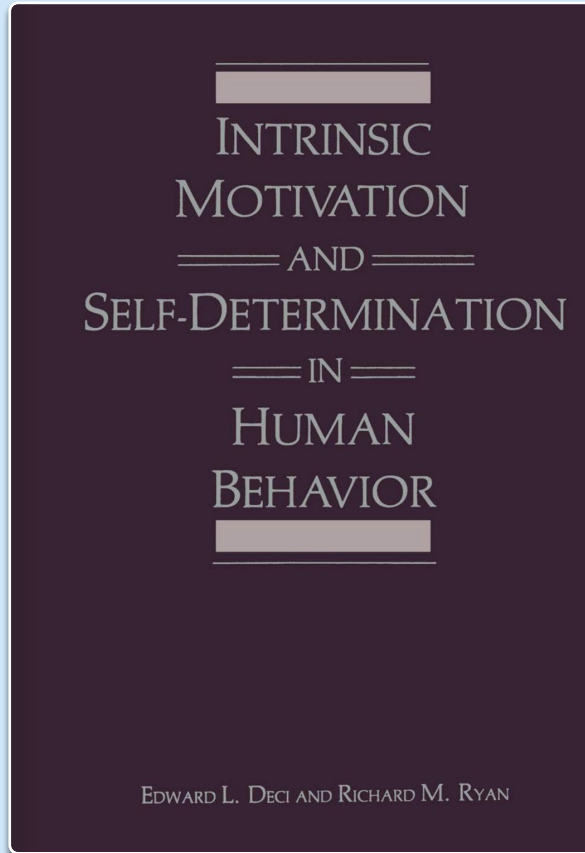
**competence**

**3**

**relatedness to others**



# Self-Determination Theory (SDT)



1985

**Edward L. Deci**  
**Richard M. Ryan**

# Self-Determination Theory (SDT)

## 1 autonomy

**feeling of volition and choice in actions,  
feeling that you are an agent of your own behaviour, freedom to experiment**

? Do you feel you can be yourself at work?

? Do you feel that your job tasks are in line with what you really want to do?

? Do you feel free to do your job the way you think it could best be done?

# Self-Determination Theory (SDT)

**2****competence**

**feeling that you are effective,  
able to achieve goals, develop and demonstrate your knowledge and skills**

**?**

Do you feel that you have the skills and resources needed to perform your job effectively?

**?**

Do you feel that you are able to apply your knowledge and skills to make meaningful contributions?

**?**

Do you feel that your job tasks and responsibilities align with your skills and strengths?

# Self-Determination Theory (SDT)

## 3 relatedness to others

**feeling that you are included, seen, needed, appreciated and supported**

? Do you feel supported and valued by your colleagues and manager?

? Do you feel like you belong to your team / organization?

? Do you receive feedback or recognition that you are doing a good job?

**Which one is  
the most important  
for boosting productivity?**

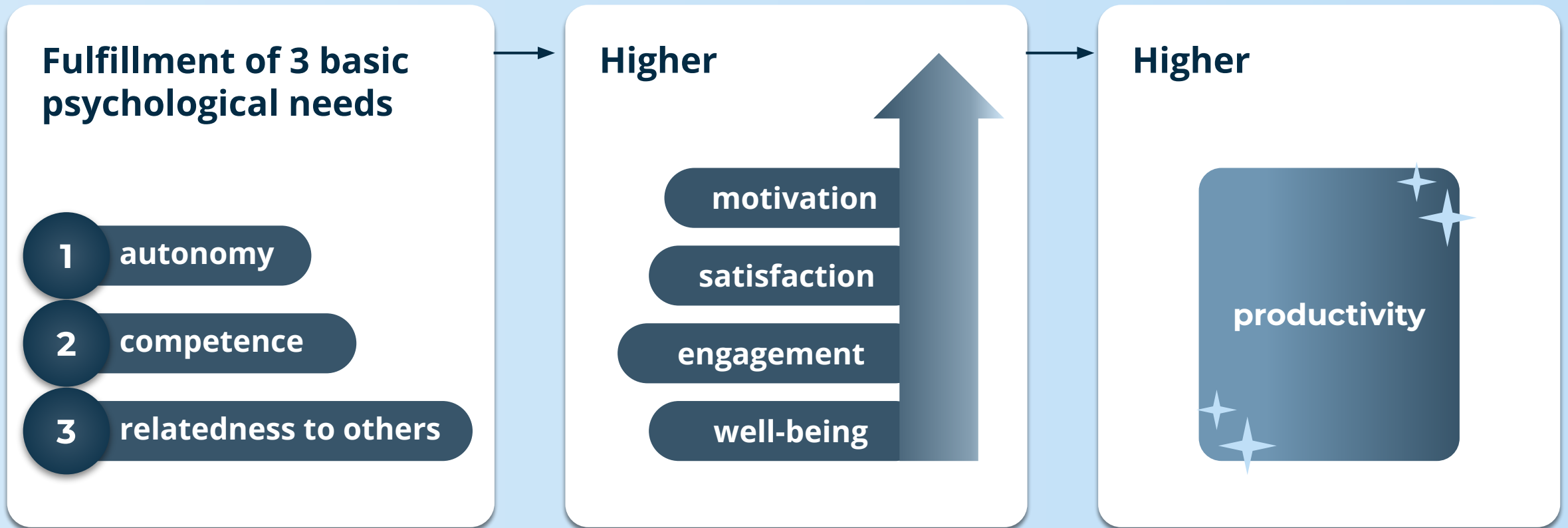
**1****autonomy****2****competence****3****relatedness to others**

*Remember your answer, we'll get back to it later*

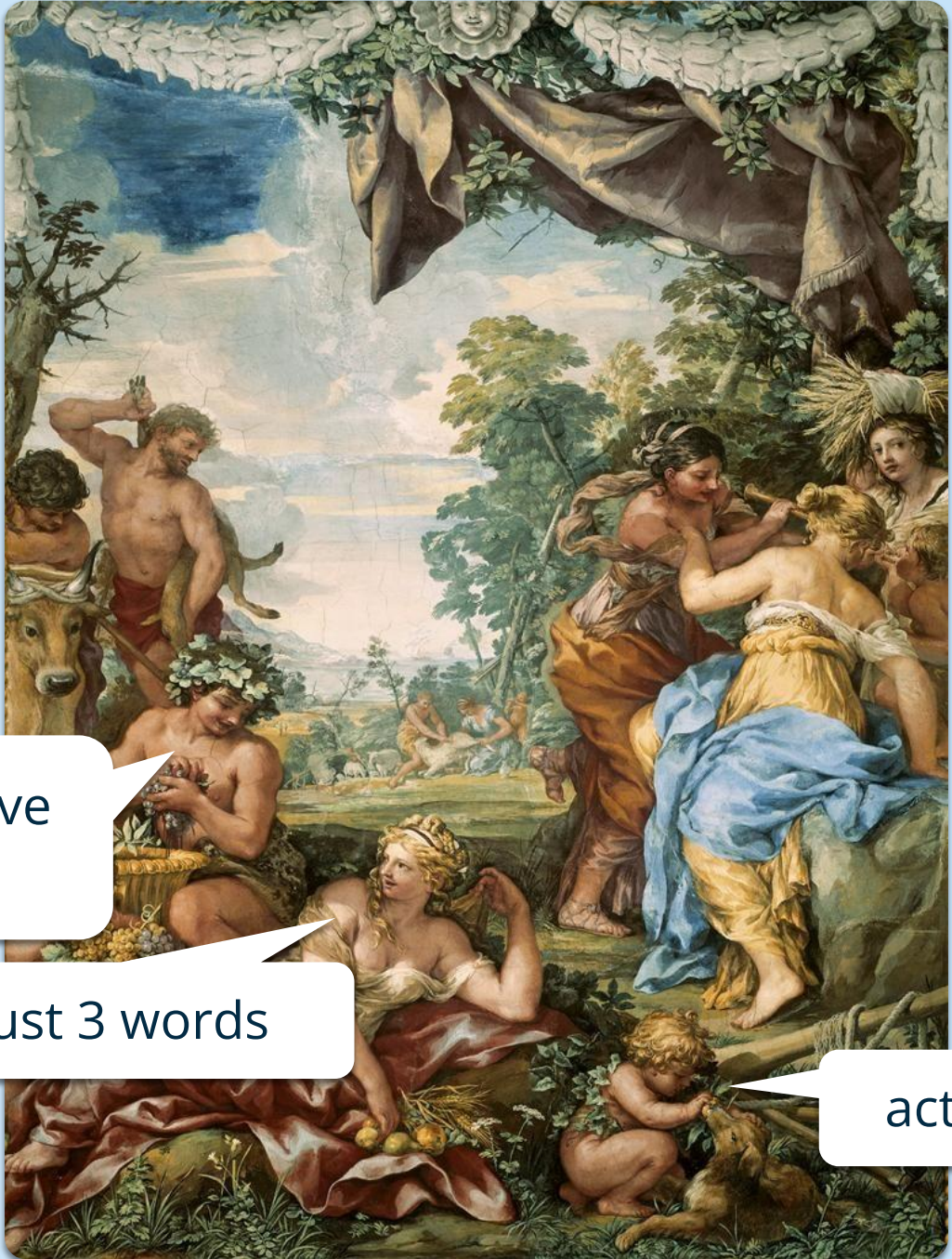
# Self-Determination Theory (SDT)

*Deci, Ryan, 1985*

It is an axiom – all people have basic psychological needs



*Pietro da Cortona  
- The Golden Age*

The painting 'The Golden Age' by Pietro da Cortona depicts a lush, idyllic landscape where humans and animals coexist in harmony. In the foreground, a woman reclines on a red cloth, surrounded by fruit, while a cherub plays with a dog. To the left, a man stands with a bull, and another figure sits nearby. In the center-right, a group of people are engaged in a dance or musical performance. The background shows a peaceful valley with more figures and animals under a sky with soft clouds. A large, draped cloth hangs from a tree at the top, and a cherub's face is visible in the upper left corner.

how are you so productive  
all the time?

it is just 3 words

actually 5

# Our plan for today

Theory

**Application**

AI

Takeaway

# “What Predicts Software Developers’ Productivity?”

*Murphy-Hill et al., 2021*

1

## What Predicts Software Developers’ Productivity?

Emerson Murphy-Hill, Ciera Jaspan, Caitlin Sadowski, David Shepherd, Michael Phillips, Collin Winter, Andrea Knight, Edward Smith and Matthew Jorde

**Abstract**—Organizations have a variety of options to help their software developers become their most productive selves, from modifying office layouts, to investing in better tools, to cleaning up the source code. But which options will have the biggest impact? Drawing from the literature in software engineering and industrial/organizational psychology to identify factors that correlate with productivity, we designed a survey that asked 622 developers across 3 companies about these productivity factors and about self-rated productivity. Our results suggest that the factors that most strongly correlate with self-rated productivity were non-technical factors, such as job enthusiasm, peer support for new ideas, and receiving useful feedback about job performance. Compared to other knowledge workers, our results also suggest that software developers’ self-rated productivity is more strongly related to task variety and ability to work remotely.

**Index Terms**—Productivity factors, software engineers, knowledge workers

### 1 Introduction

Improving productivity of software developers is important. By definition, developers who have completed their tasks can spend their freed-up time on other useful tasks, such as implementing new features or on new verification and validation activities. But what causes developers to be more productive?

Organizations such as ours demand empirical guidance on which factors to try to manipulate in order to best improve productivity. For example, should an individual developer (1a) spend time seeking out the best tools and practices, or (1b) shut down email notifications during the day?<sup>1</sup>

generalize and do not generalize, we adapted and deployed the survey at two other companies in different industries. To answer the third question, which helps explain what differentiates software developers from other groups, we adapted and deployed the survey with non-developer knowledge workers, and compared the results to that of software developers.

Our results suggest that the factors that strongly correlate with self-rated productivity across the companies we studied were job enthusiasm, peer support for new ideas, and receiving useful feedback about job performance. Compared to other knowledge workers, our results also suggest that software de-



<https://ieeexplore.ieee.org/abstract/document/8643844>

# “What Predicts Software Developers’ Productivity?”

*Murphy-Hill et al., 2021*

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# “What Predicts Software Developers’ Productivity?”

*Murphy-Hill et al., 2021*



We assume that

job enthusiasm

useful feedback about job performance

peer support for new ideas

# “What Predicts Software Developers’ Productivity?”

*Murphy-Hill et al., 2021*



We assume that

job enthusiasm

**1 autonomy**

**2 competence**

useful feedback about job performance

**2 competence**

**3 relatedness to others**

peer support for new ideas

**1 autonomy**

**2 competence**

**3 relatedness to others**

# Which social and technical factors impact job satisfaction and perceived productivity?

*Storey et al., 2021*

## Towards a Theory of Software Developer Job Satisfaction and Perceived Productivity

Margaret-Anne Storey, *Member, IEEE*, Thomas Zimmermann, *Member, IEEE*,  
Christian Bird, *Member, IEEE*, Jacek Czerwonka, *Member, IEEE*, Brendan Murphy, *Member, IEEE*,  
Eirini Kalliamvakou, *Member, IEEE*



**Abstract**—Developer satisfaction and work productivity are important considerations for software companies. Enhanced developer satisfaction may improve the attraction, retention and health of employees, while higher productivity should reduce costs and increase customer satisfaction through faster software improvements. Many researchers and companies assume that perceived productivity and job satisfaction are related and may be used as proxies for one another, but these claims are a current topic of debate. There are also many social and technical factors that may impact satisfaction and productivity, but which factors have the most impact is not clear, especially for specific development contexts. Through our research, we developed a theory articulating a bi-directional relationship between software developer job satisfaction and perceived productivity, and identified what additional social and technical factors, challenges and work context variables influence this relationship. The constructs and relationships in our theory were derived in part from related literature in software engineering and knowledge work, and we validated and extended these concepts through a rigorously designed survey instrument. We instantiate our theory with a large software company, which suggests a number of propositions about the

constructs such as satisfaction, happiness, and motivation [9], [10]. Combined, this work enhances our understanding by indicating the things that could contribute to developers feeling satisfied or feeling productive. However, we lack an understanding of the *relationship* between these elements and how it could improve software engineering outcomes.

The research we present in this paper aims to understand and explain the relationship between job satisfaction and perceived productivity for software engineers. Our investigation was informed by seminal work in organizational psychology by Judge *et al.*, where job satisfaction is widely accepted to be positively correlated with work performance [10]. We build on this work to investigate which factors influence the relationship between developer satisfaction and perceived productivity in software engineering.



<https://ieeexplore.ieee.org/abstract/document/8851296>

# Which social and technical factors impact job satisfaction and perceived productivity?

*Storey et al., 2021*

Top factors of perceived productivity are:

a good manager

feeling productive

being fairly rewarded

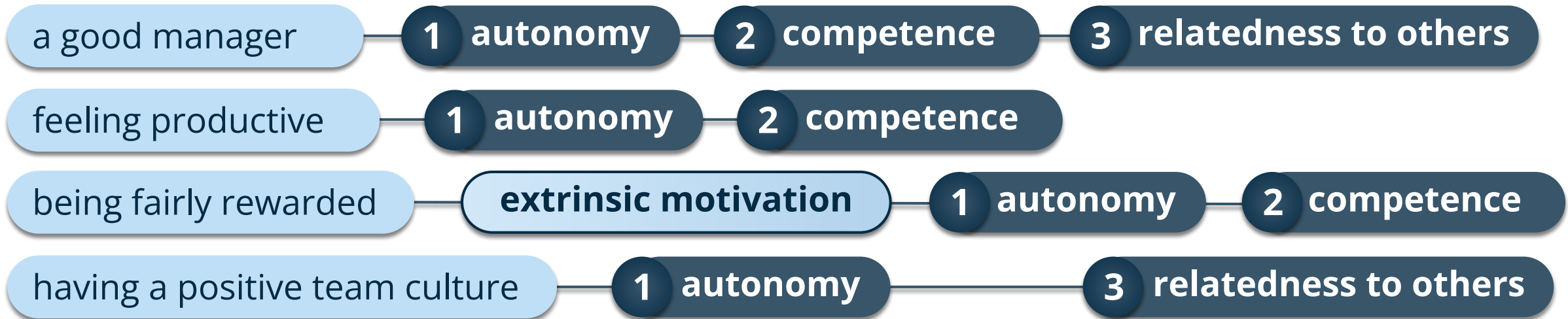
having a positive team culture

# Which social and technical factors impact job satisfaction and perceived productivity?

*Storey et al., 2021*

Top factors of perceived productivity are:

We assume that



LET'S LOOK  
AT **DEVELOPER PRODUCTIVITY**  
MORE **HOLISTICALLY**

# SPACE framework

*Forsgren et al., 2021*



## The **SPACE** of Developer Productivity

**THERE'S MORE  
TO IT THAN  
YOU THINK.**

NICOLE FORSGREN, *Github*  
MARGARET-ANNE STOREY,  
*University Of Victoria*  
CHANDRA MADDILA,  
THOMAS ZIMMERMANN,  
BRIAN HOUCK, AND  
JENNA BUTLER,  
*Microsoft Research*

**D**eveloper productivity is complex and nuanced, with important implications for software development teams. A clear understanding of defining, measuring, and predicting developer productivity could provide organizations, managers, and developers with the ability to make higher-quality software—and make it more efficiently.

Developer productivity has been studied extensively. Unfortunately, after decades of research and practical



<https://dl.acm.org/doi/abs/10.1145/3454122.3454124>

# SPACE framework

*Forsgren et al., 2021*

**S**atisfaction & Well-being

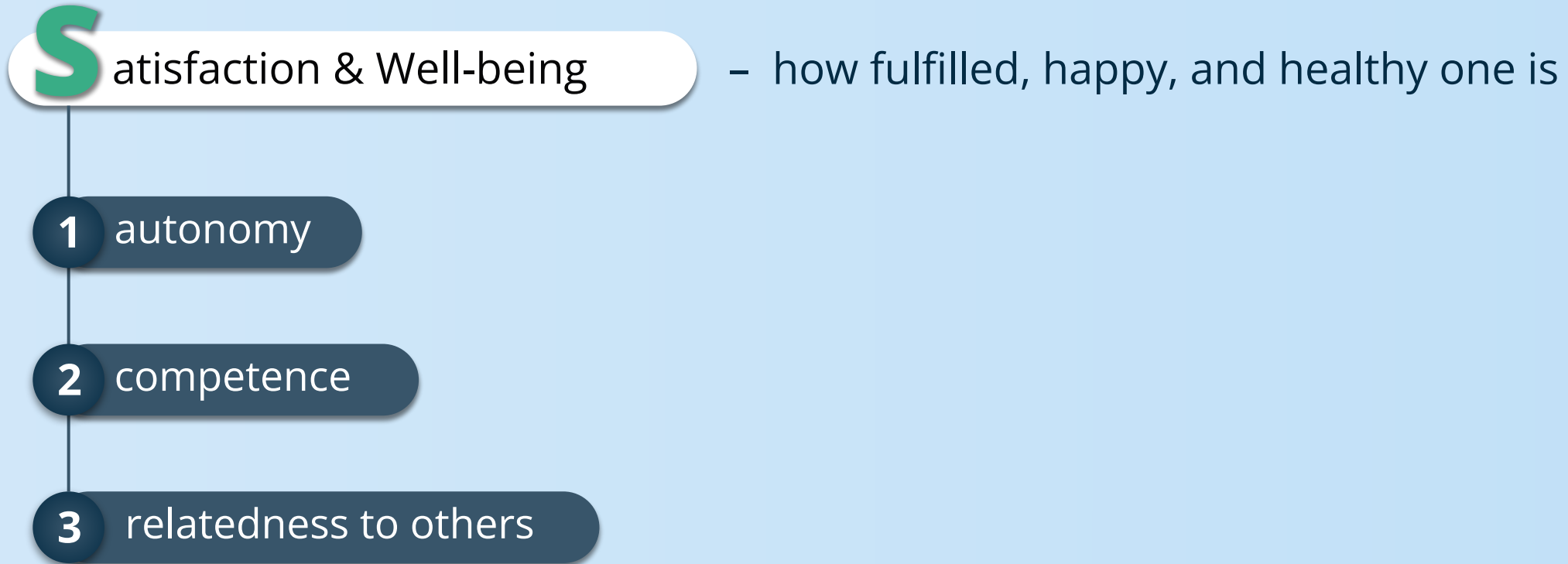
**P**erformance

**A**ctivity

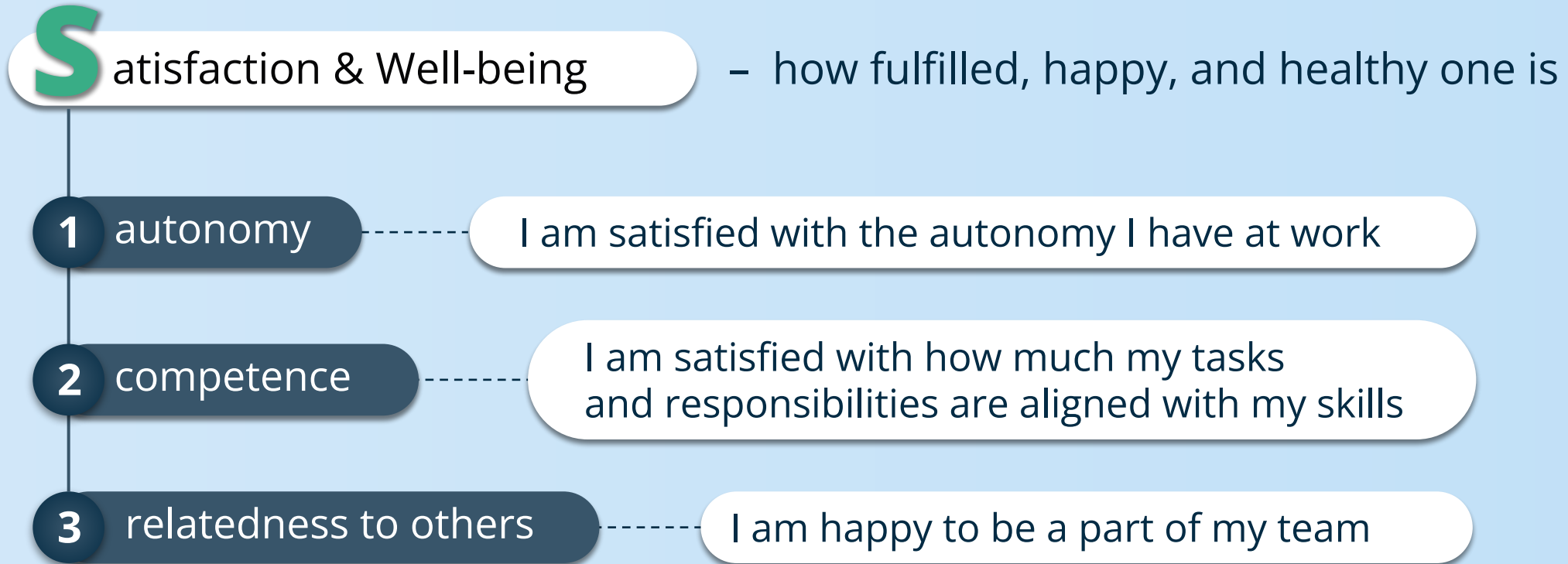
**C**ommunication & collaboration

**E**fficiency & flow

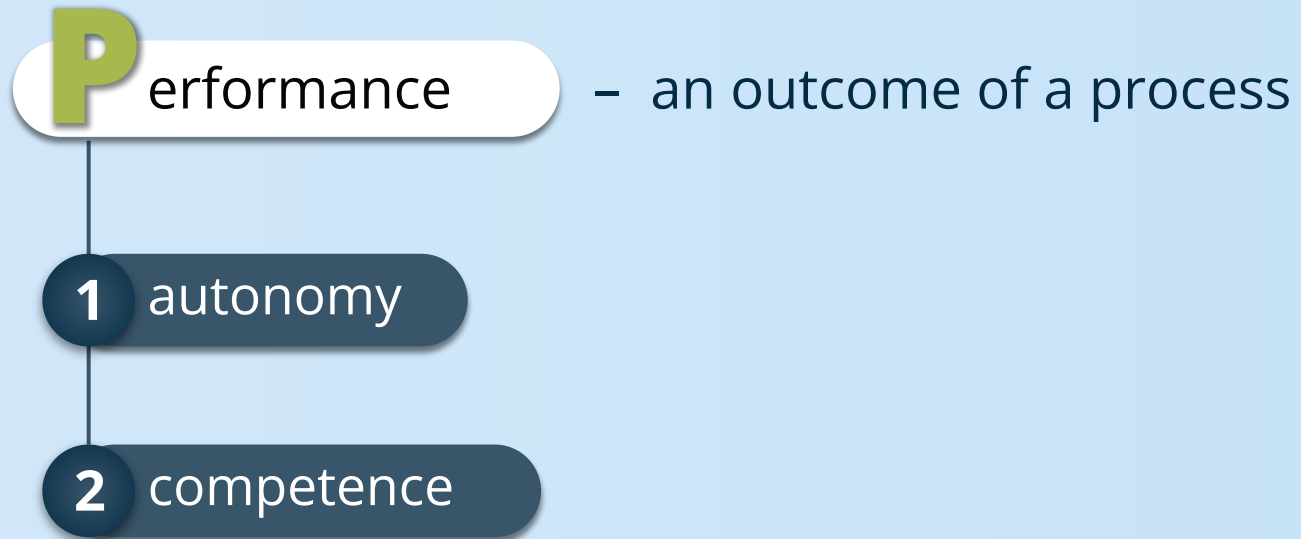
# SPACE framework & SDT



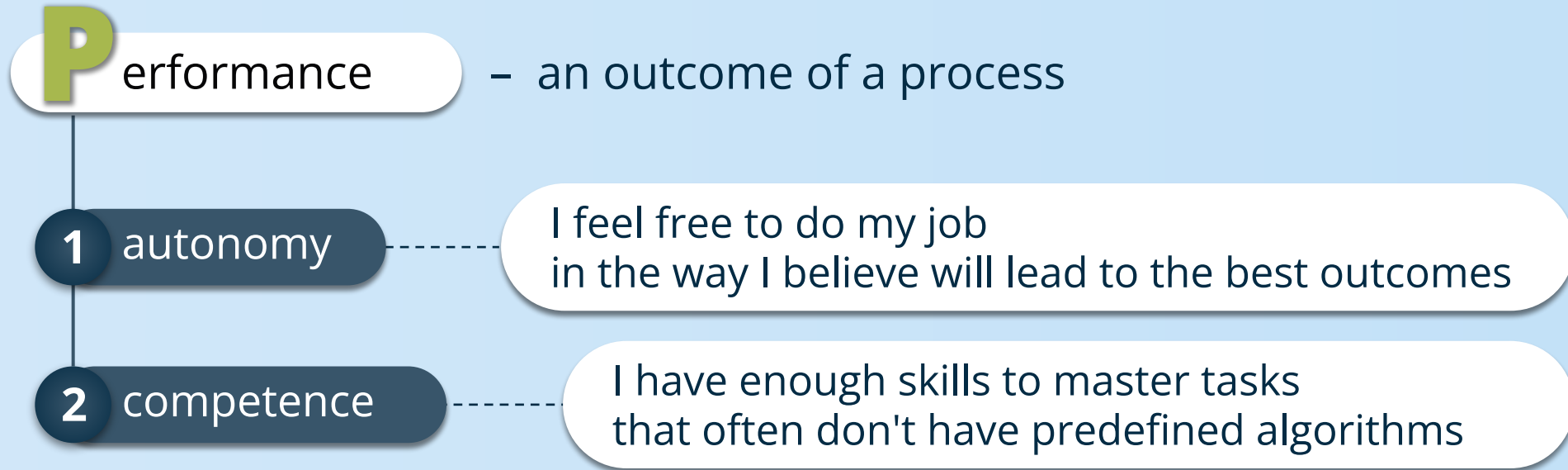
## SPACE framework & SDT



# SPACE framework & SDT



# SPACE framework & SDT



# SPACE framework & SDT

**A**ctivity

- the number of actions or outputs (data from logs and systems)



here is your  
low hanging fruit

*Lucas Cranach the Elder  
– Adam and Eve*

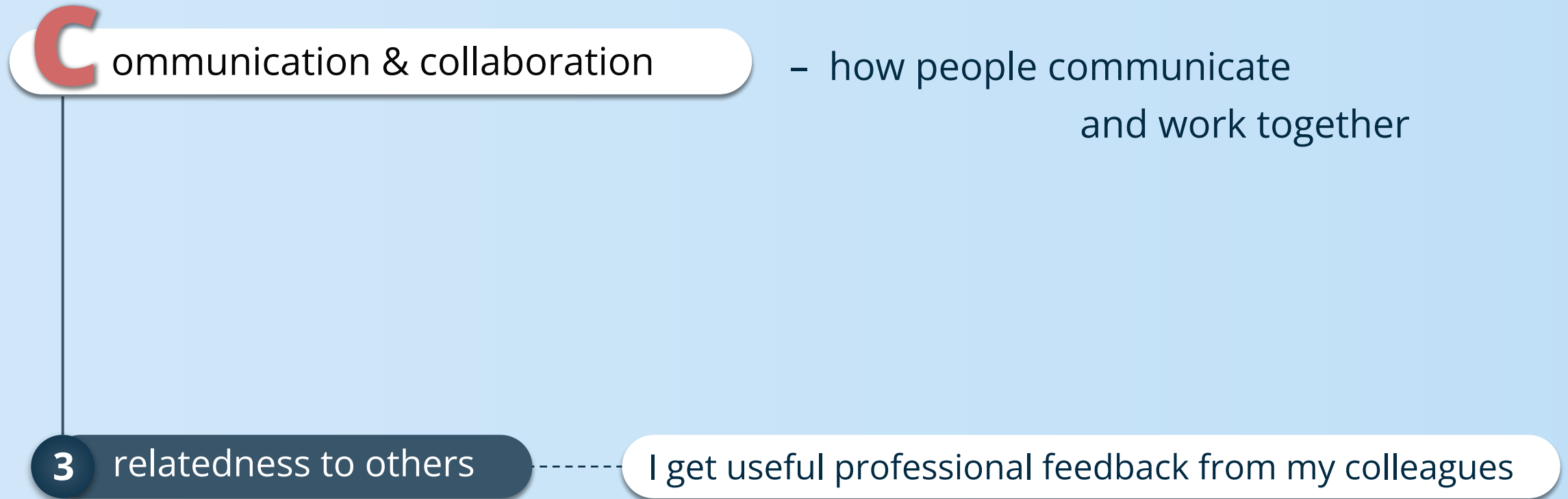
# SPACE framework & SDT

**C**ommunication & collaboration

– how people communicate  
and work together

**3** relatedness to others

# SPACE framework & SDT



# SPACE framework & SDT

**E**

fficiency & flow

– doing work with minimal delays or interruptions

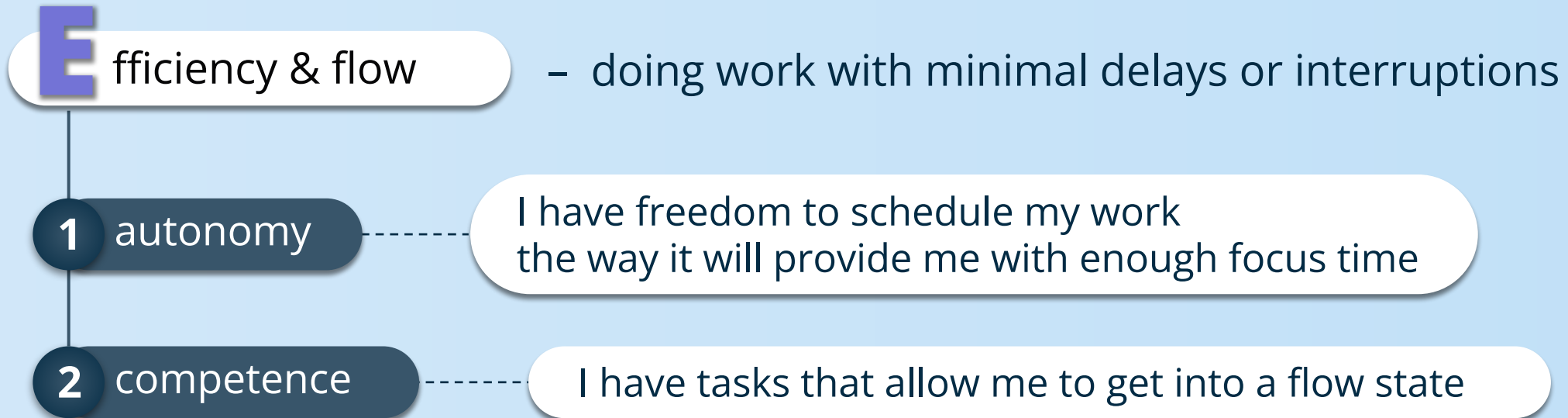
1

autonomy

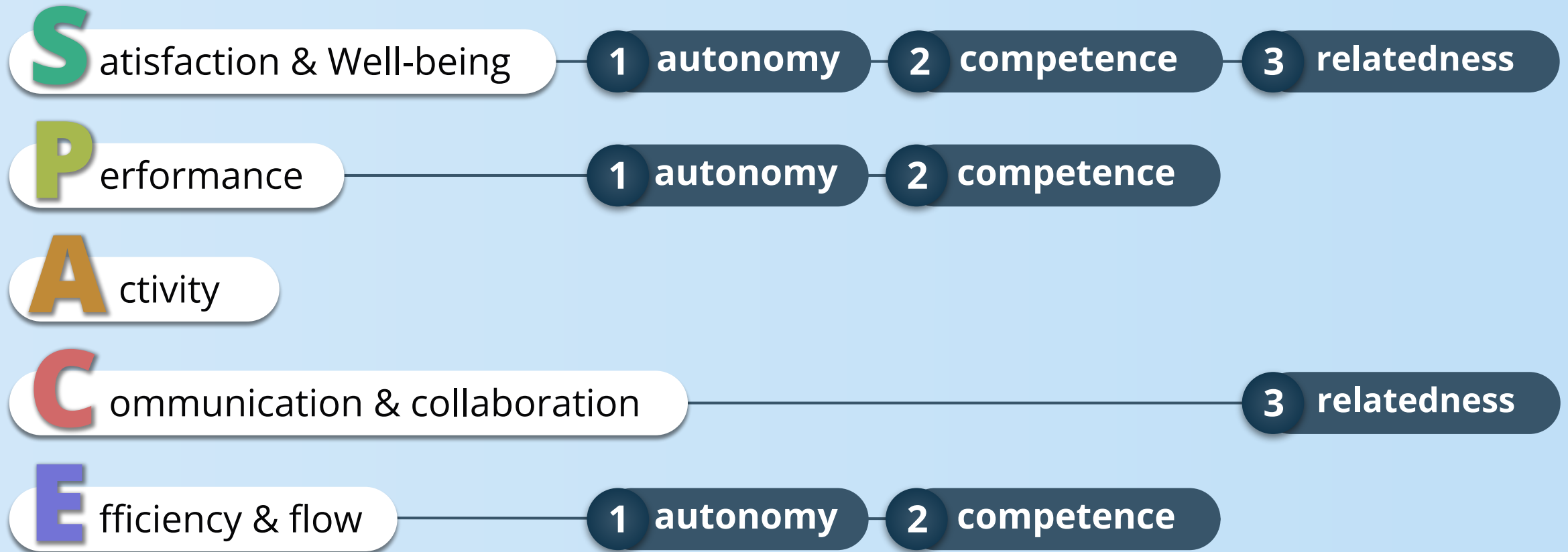
2

competence

# SPACE framework & SDT



# SPACE framework



DEVELOP TOOLS OR PROCESSES  
SO THAT THEY **ENHANCE DEVELOPERS'** SENSES OF

**autonomy**

**competence**

**relatedness to others**

## AND WHAT ABOUT TECH MANAGERS..?

**autonomy**

**competence**

**relatedness to others**

# Developer Ecosystem Survey

*DX Research & Survey Teams at JetBrains*

## Welcome to the State of Developer Ecosystem Report 2024

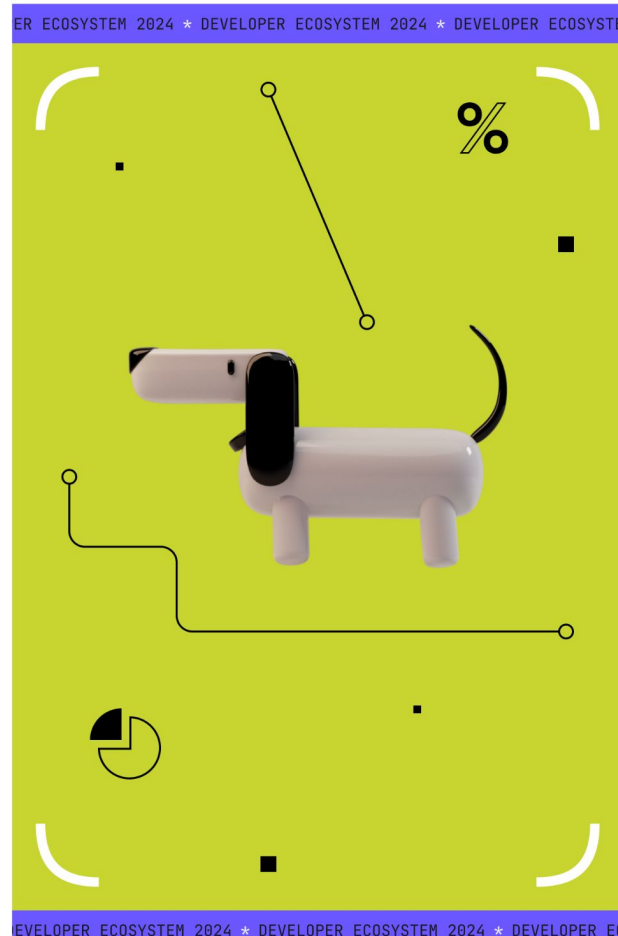
Every year, we release the State of Developer Ecosystem Report to capture a snapshot of the developer world. This time, we're keeping it streamlined – just the highlights on one web page, bringing together the most compelling insights from our research. The full raw data is available to download if you'd like to dig deeper.

Based on the responses from **23,262** developers worldwide, this report shines a bright light on the vast and diverse developer community. Our goal? To share what matters most to developers, from the programming languages, tools, and technologies they rely on to key issues shaping the industry.

This year, we continue exploring developers' views on AI across various areas. Spoiler alert: Fear of AI seems to be diminishing! We also take a closer look at career and employment trends, diversity in the field, and even some insights into the recent mass layoffs in the sphere.

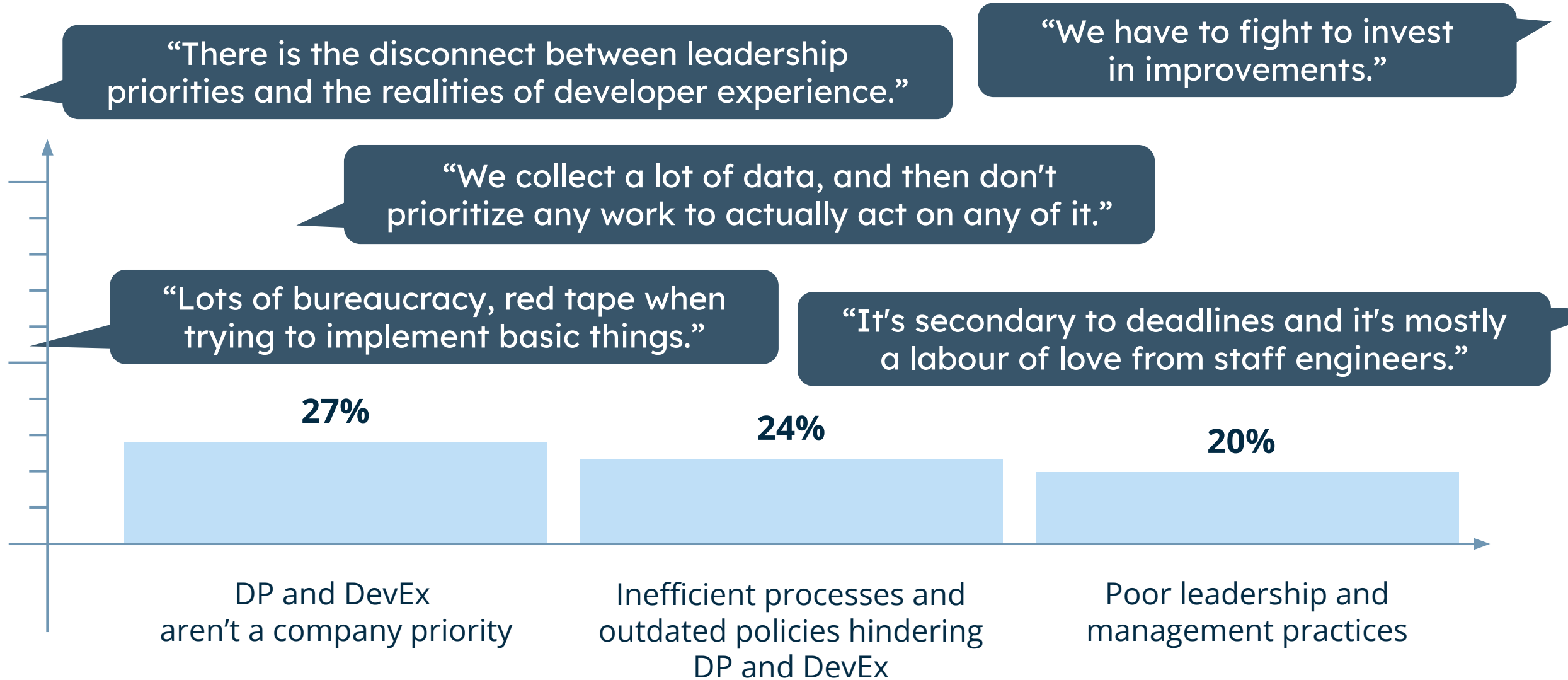
**i** This is a public report; its contents may be used only for non-commercial purposes. Get the full details [here](#).

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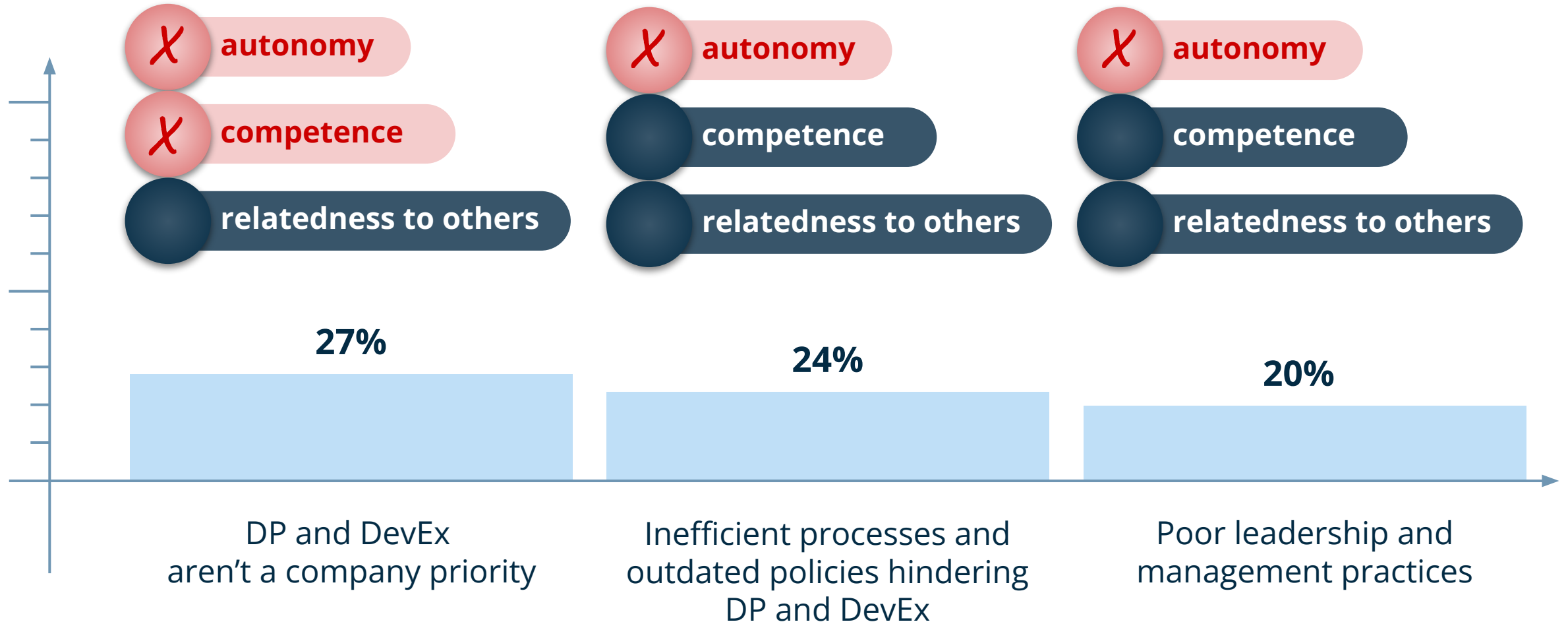
<https://www.jetbrains.com/lp/devecosystem-2024/>

## Tech managers say...





We assume that



DEVELOP TOOLS AND PROCESSES  
SO THAT THEY **ENHANCE** **EVERYONE'S**  
(incl. MANAGERS') SENSES OF

**autonomy**

**competence**

**relatedness to others**

Yanina Ledovaya & Olga Lvova



<https://lp.jetbrains.com/stateofdevex/>

## The State of Developer Experience and Developer Productivity **2025**



# Our plan for today

Theory

Application

**AI**

Takeaway

# “Toward Effective AI Support for Developers”

*Khemka, Houck, 2024*

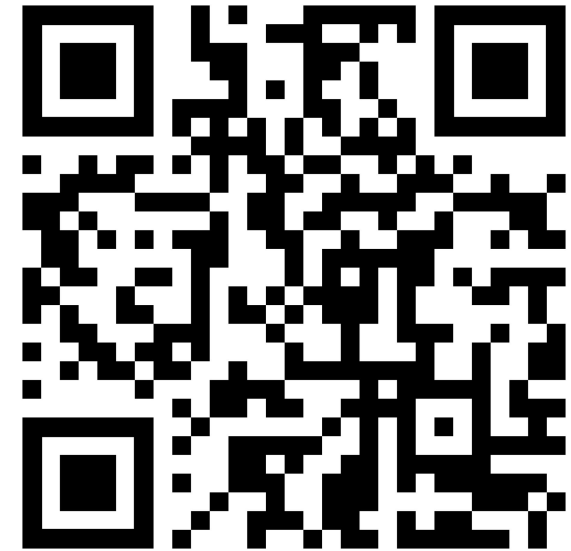


## Toward Effective AI Support for Developers

**A SURVEY OF DESIRES AND CONCERNS**

MANSI KHEMKA AND BRIAN HOUCK

**Y**ears of software engineering and product development have taught us that the best way to build products that delight customers is to talk to customers. Talking to actual customers provides important insights into their challenges, and their loves. This leads to innovative and creative ways of solving problems (without creating new ones) and guards against ruining workflows the customers are already delighted with.



<https://dl.acm.org/doi/abs/10.1145/3675416>

# “Toward Effective AI Support for Developers”

*Khemka, Houck, 2024*

## Developers want AI to assist them with:

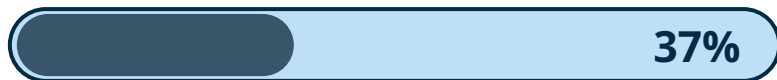
generating tests



analyzing code



writing documentation



# “Toward Effective AI Support for Developers”

*Khemka, Houck, 2024*

## Developers want AI to assist them with:

generating tests

44%

analyzing code

42%

writing documentation

37%



Dear AI, please  
do these tasks for us

*Sano di Pietro – Scenes from the Life of Saint Jerome, fragment*

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*DX Research & Survey Teams at JetBrains*

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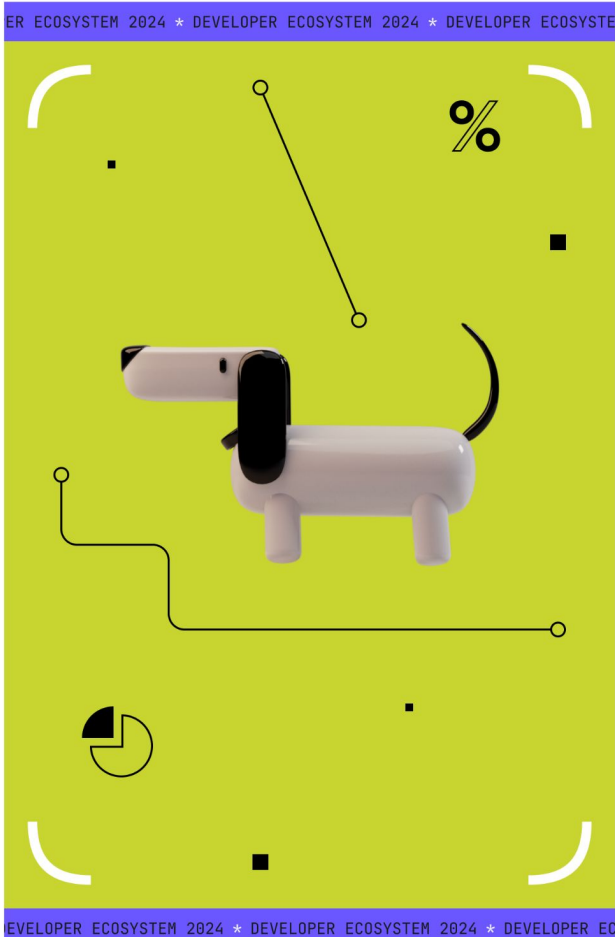
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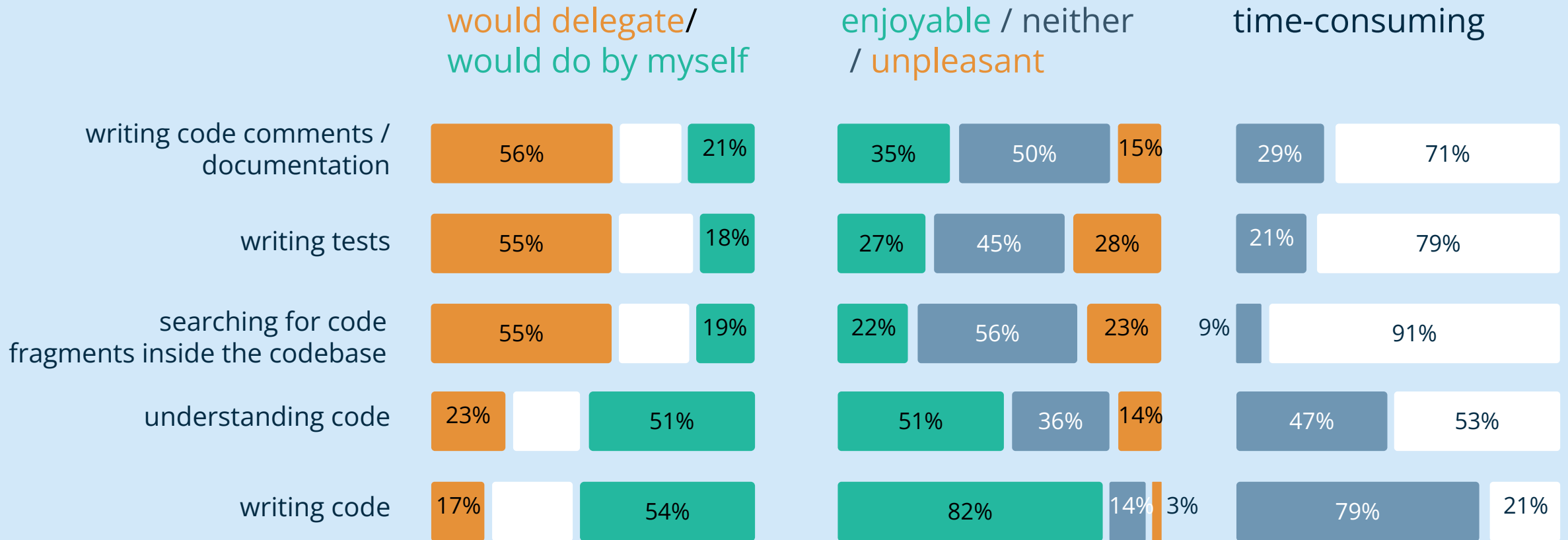
Share:     



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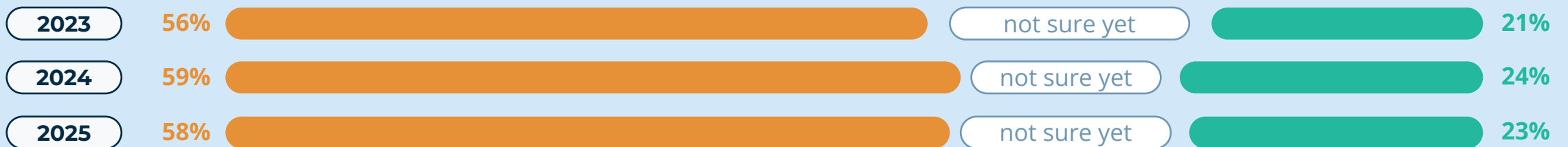
*DX Research & Survey Teams at JetBrains 2023*



# Developer Ecosystem Survey

would delegate / not sure yet / would do by myself

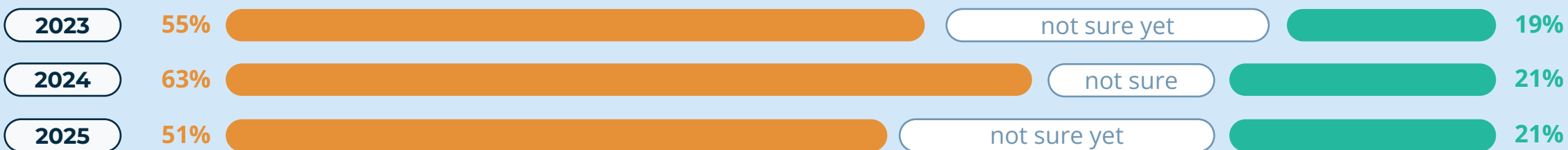
writing code comments / documentation



# Developer Ecosystem Survey

would delegate / not sure yet / would do by myself

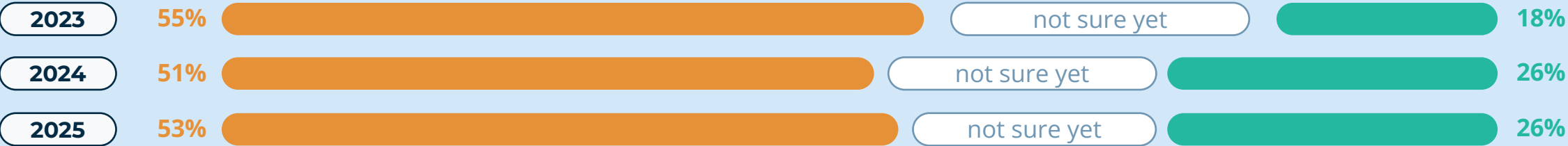
searching for code fragments inside the codebase



# Developer Ecosystem Survey

would delegate / not sure yet / would do by myself

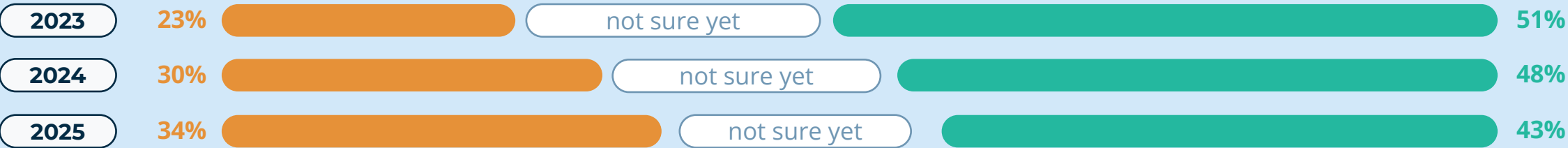
writing tests



# Developer Ecosystem Survey

would delegate / not sure yet / would do by myself

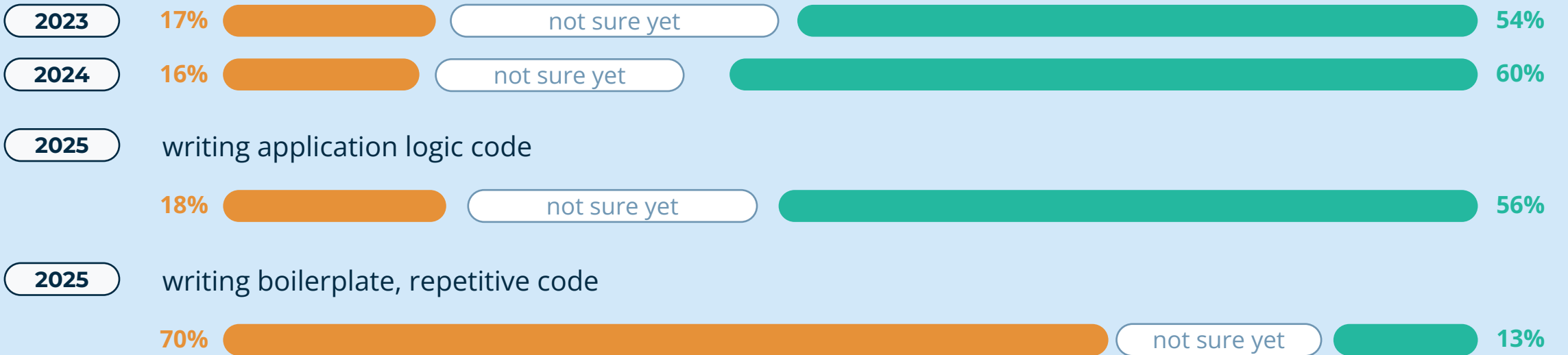
understanding code



# Developer Ecosystem Survey

would delegate / not sure yet / would do by myself

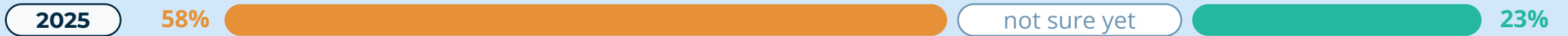
writing code



# Developer Ecosystem Survey

would delegate / not sure yet / would do by myself

writing code comments / documentation



writing tests



searching for code fragments inside the codebase



understanding code



writing application logic code



writing boilerplate, repetitive code



# Developer Ecosystem Survey

How developers ***expect their workflows to change*** over the next 1–3 years



*Sano di Pietro – Scenes from the Life of Saint Jerome, fragment*

# Developer Ecosystem Survey

How developers ***expect their workflows to change*** over the next 1–3 years



*Sano di Pietro – Scenes from the Life of Saint Jerome, fragment*

# Developer Ecosystem Survey

*How developers expect their workflows to change over the next 1–3 years*

## Developers expect AI...

47%



to speed up learning

44%



to take over repetitive or boilerplate tasks

42%



to generate initial drafts of code

# Developer Ecosystem Survey

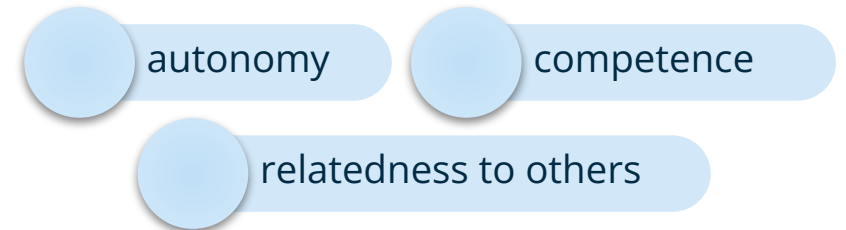
*How developers expect their workflows to change over the next 1–3 years*

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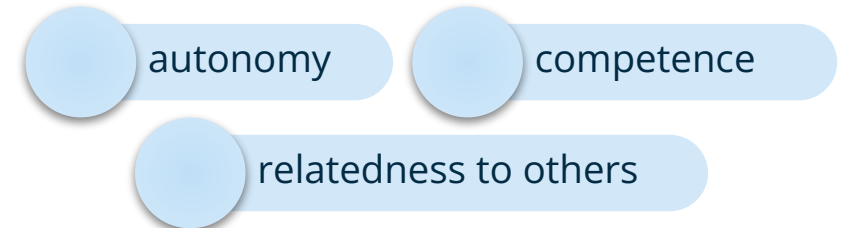
to speed up learning



44%



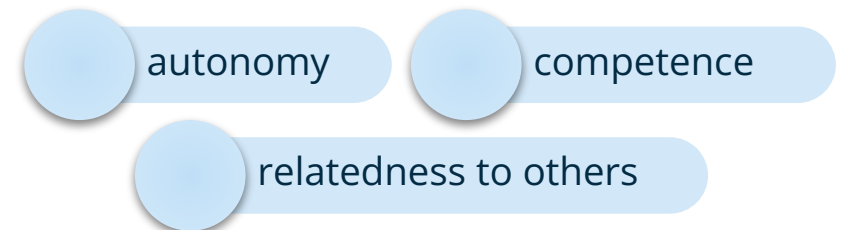
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42%



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# Developer Ecosystem Survey

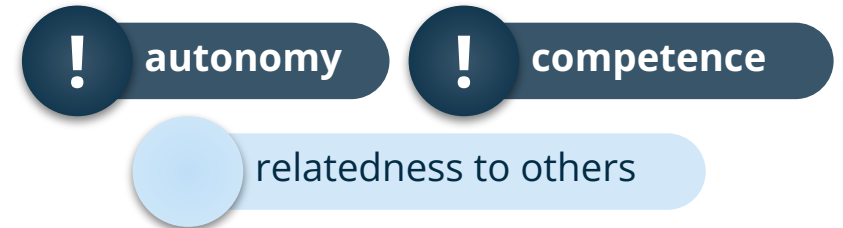
*How developers expect their workflows to change over the next 1–3 years*

## Developers expect AI...

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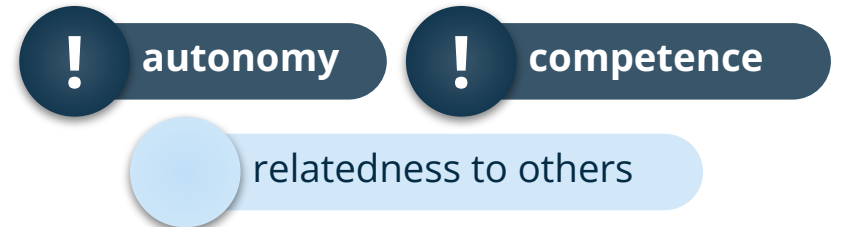
to speed up learning



44%



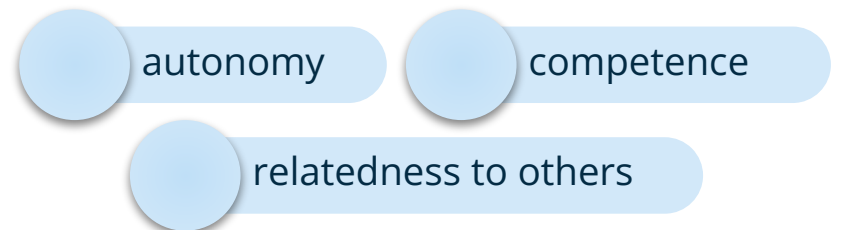
to take over repetitive or boilerplate tasks



42%



to generate initial drafts of code



# Developer Ecosystem Survey

How developers **expect their workflows to change** over the next 1–3 years



*Sano di Pietro – Scenes from the Life of Saint Jerome, fragment*

## 39%

of developers see AI  
as a way to spend more time  
on meaningful work

# Developer Ecosystem Survey

How developers **expect their workflows to change** over the next 1–3 years



we still have our  
meaningful work, right?

# 39%

of developers see AI  
as a way to spend more time  
on meaningful work

*Sano di Pietro – Scenes from the Life of Saint Jerome, fragment*

DEVELOP “AI-POWERED ANYTHING” SO THAT  
IT ENHANCES **USERS’** SENSES OF

autonomy

competence

relatedness to others

# Our plan for today

Theory

Application

AI

**Takeaway**

How likely your decisions  
will **increase or decrease** your colleagues'...



**feeling autonomous**



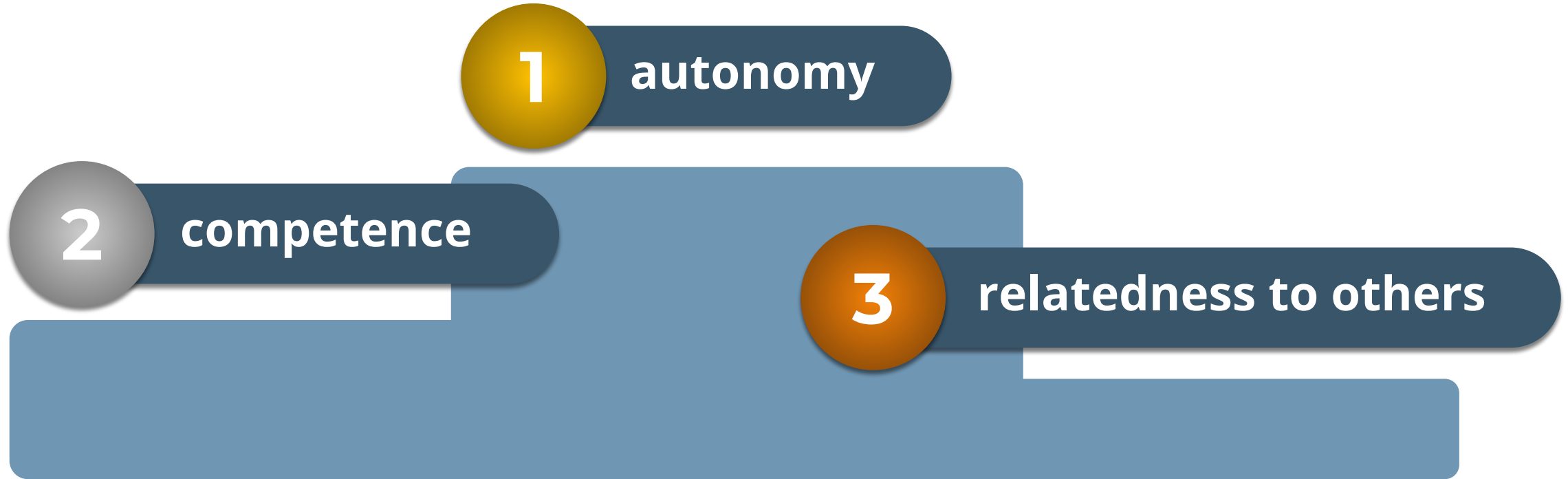
**feeling competent**



**feeling related**

**Which one is  
the most important  
for boosting productivity?**

**1****autonomy****2****competence****3****relatedness to others**



According to the research, fulfillment of the **need for autonomy** has the greatest impact on productivity

# Be **an autonomy supportive** human

- ✓ Acknowledge others' perspectives
  - ✓ Offer choices where possible
  - ✓ Provide meaningful feedback
  - ✓ Encourage initiative
- 
- ✓ **Ask people**

*Pablo Picasso –  
Acrobat on a Ball*

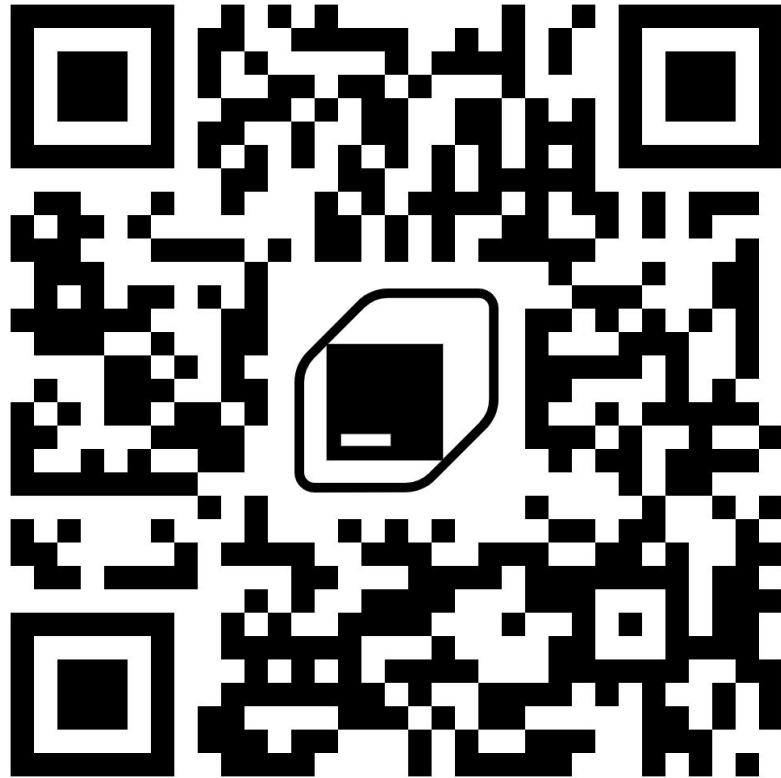
it is just 3 words

(and balance)

how is your team  
so productive?



Yanina Ledovaya & Olga Lvova



<https://lp.jetbrains.com/stateofdevex/>

## The State of Developer Experience and Developer Productivity **2025**



# QUESTIONS?

ASK ME IN THE APP

# **RATE THIS SESSION**

YES, YOU'LL GET A REWARD