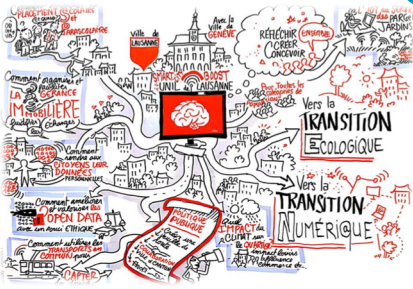# THE BRIGHT AND DARK SIDE OF A CONNECTED WORKPLACE FOR HEALTH AND WELL-BEING
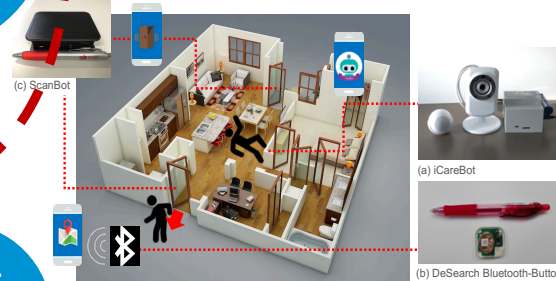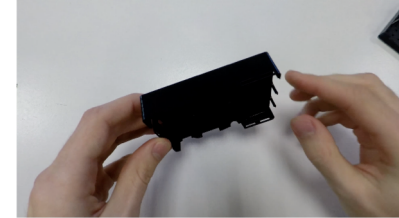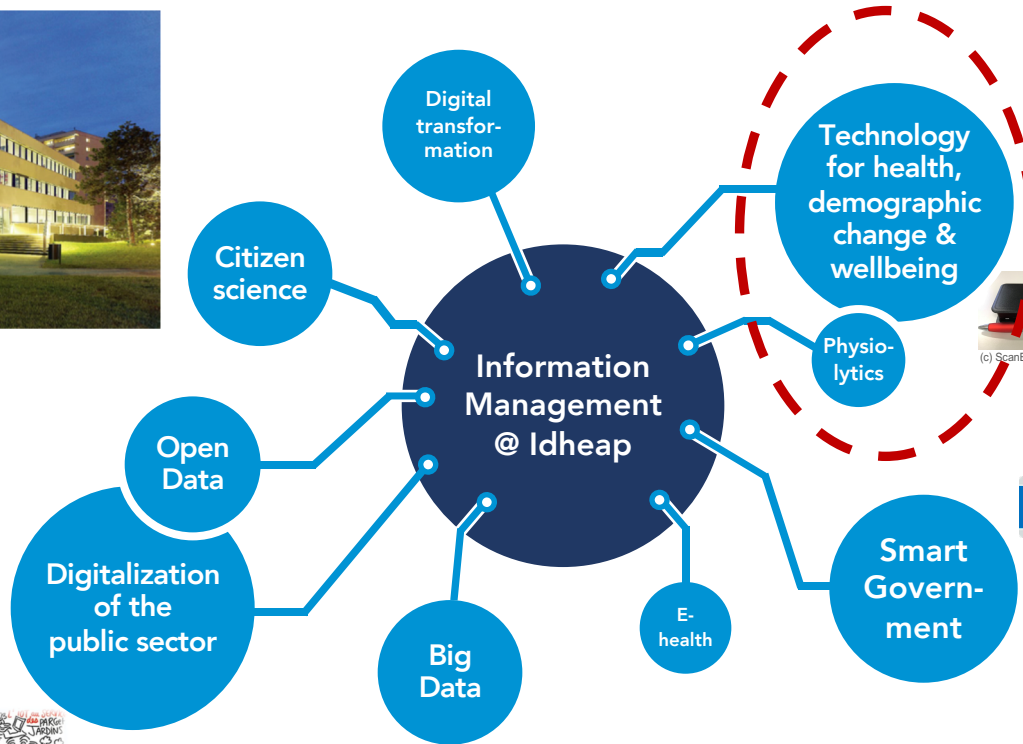
PROF. DR. TOBIAS METTLER, UNIVERSITY OF LAUSANNE

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INFORMATION MANAGEMENT @IDHEAP

Digital transformation

Citizen science

Technology for health, demographic change & wellbeing

Information Management @ Idheap

Physiolytics

Open Data

Digitalization of the public sector

Big Data

E-health

Smart Government

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IDHEAP

Schritt 1a: Zusammenbau CarnBot

(c) ScanBot

(a) iCareBot

(b) DeSearch Bluetooth-Button

How do you feel today?

SimpliCare

biovotion

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SOUNDS FAMILIAR?

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THE CONNECTED WORKPLACE AS SOLUTION FOR OUR OCCUPATIONAL HEALTH PROBLEMS?

Tracking of **stress-related variables** using biosensors and smartwatches

Contextual health and well-being tips and alerts

Environmental control devices

Physiolytics

Cloud technologies

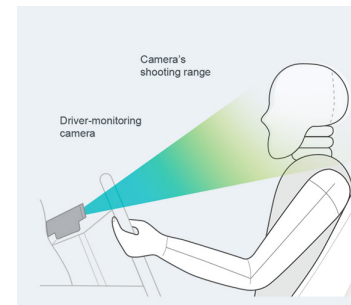Communication tools

Physical **activity tracking** in employer-sponsored health programs

Discovering **unsafe postures** of construction workers

Smart clothing

Data analytics and interactive software

Motion sensing

Mobile applications

Detecting **fatigue** of truck drivers

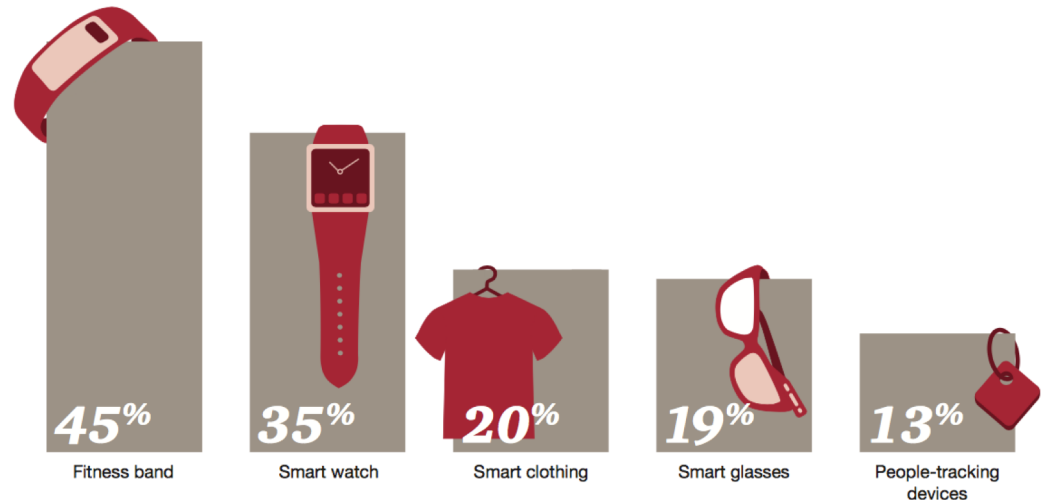Camera's shooting range

Driver-monitoring camera

See: Mettler, T., & Wulf, J. (2019). Physiolytics at the workplace: Affordances and constraints of wearables use from an employee's perspective. Information Systems Journal, 29(1), 245-273.

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BASIC ASSUMPTIONS UNDERLYING PHYSIOLYTICS AND SIMILAR TECHNOLOGIES OF THE CONNECTED WORKPLACE

Source: Wilson, H. J. (2013). "Wearables in the workplace." Harvard Business Review 91 (11), 23-25.

- **PHYSIOLYTICS** = linking of smart sensing technologies with data analytics, machine-learning, and gamified systems
- **TRANSHUMANISM** = proactive stance toward obtaining information (*tracking*) and acting on it (*performance enhancement*)

Source: HRI/CIS Wearables consumer survey 2014

* Note: This survey was conducted before the announcement of the Apple Watch.
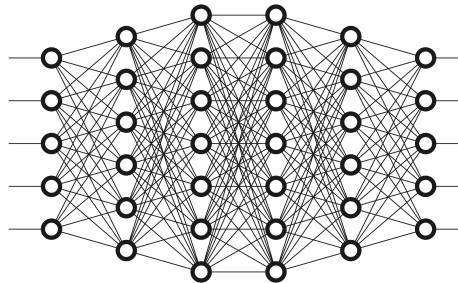
IF NOT VOLUNTARY AND PROACTIVE, THEN SUBLIMINAL

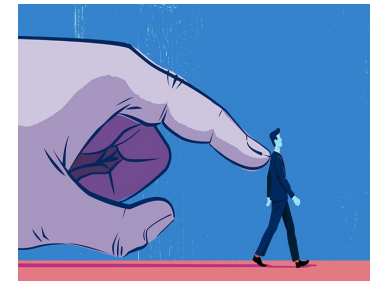| Collecting information about non-routine, complex tasks	Learning and developing responses to non-routine tasks	Changing routines and behavior to achieve desired health behavior
Physiolytics devices	Machine learning	Nudging, gamification...

WHAT ONCE WAS A TOY FOR GEEKS IS A MULTI-BILLION MARKET TODAY

THE WALL STREET JOURNAL.
Tracking Sensors Invade the Workplace
Devices on Workers, Furniture Offer Clues for Boosting Productivity

IBM adopts Apple Watch for internal fitness initiative & Watson-linked health app [u]

Wearable Devices as Facilitators, Not Drivers, of Health Behavior Change

The Rise of the 'Quantified Self' in Health Care

Know Thyself: Data Driven Self-Awareness for Understanding Our

➡ 27,5 million wearable health devices will be introduced in workplace health programs by 2020, compared with only 166,000 units in 2013

See: Chung, C. F., Gorm, N., Shklovski, I. A., & Munson, S. (2017). Finding the right fit: understanding health tracking in workplace wellness programs. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 4875-4886).
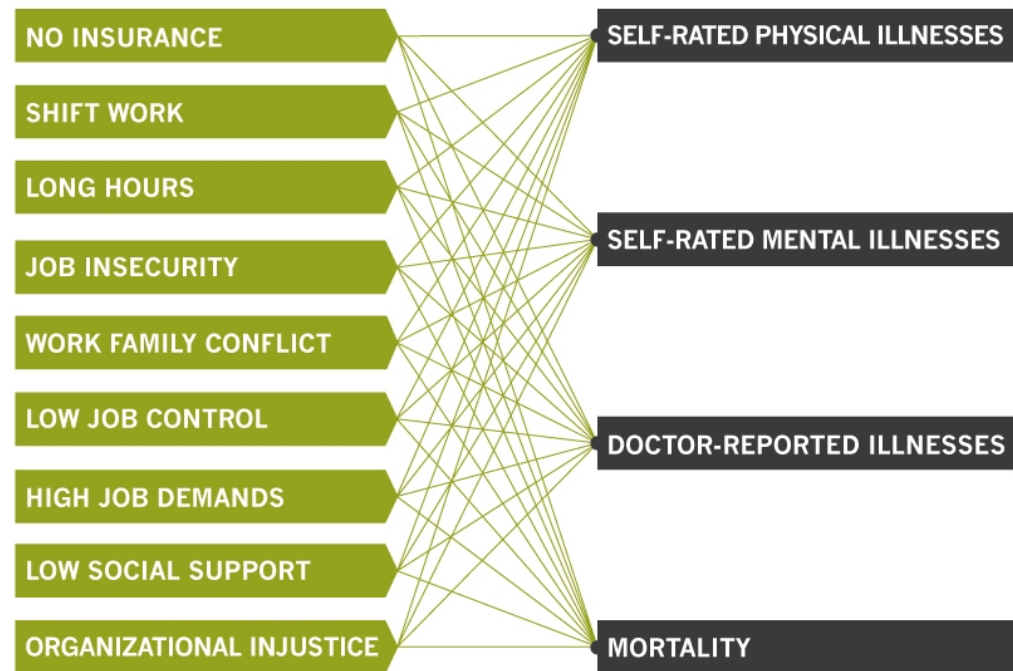
# PARTICULARLY WORK-RELATED STRESS HAS BEEN THE CENTER OF ATTENTION

Source: Gesundheitsförderung Schweiz (2019). Job-Stress-Index 2018 Kennzahlen zum Stress bei Erwerbstätigen in der Schweiz, Bern.

Source: Lynch S (2015) Why Your Workplace Might Be Killing You - Stanford scholars identify 10 work stressors that are destroying your health, https://www.gsb.stanford.edu/insights/why-your-workplace-might-be-killing-you

NOTE: WE ARE GOOD IN CAPTURING PHYSICAL, NOT SO GOOD WITH THE BEHAVIORAL AND MENTAL DIMENSION OF STRESS
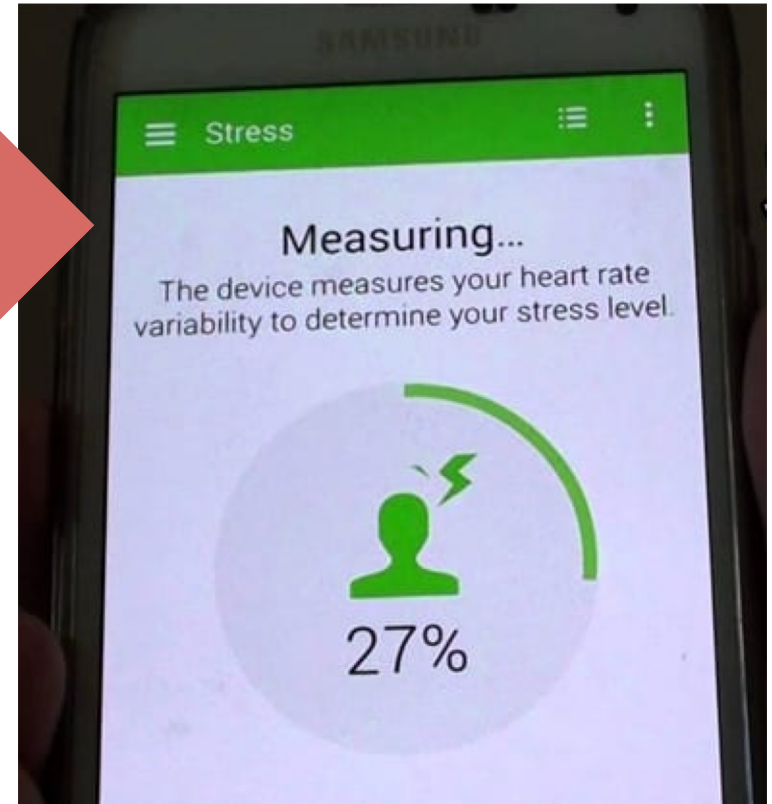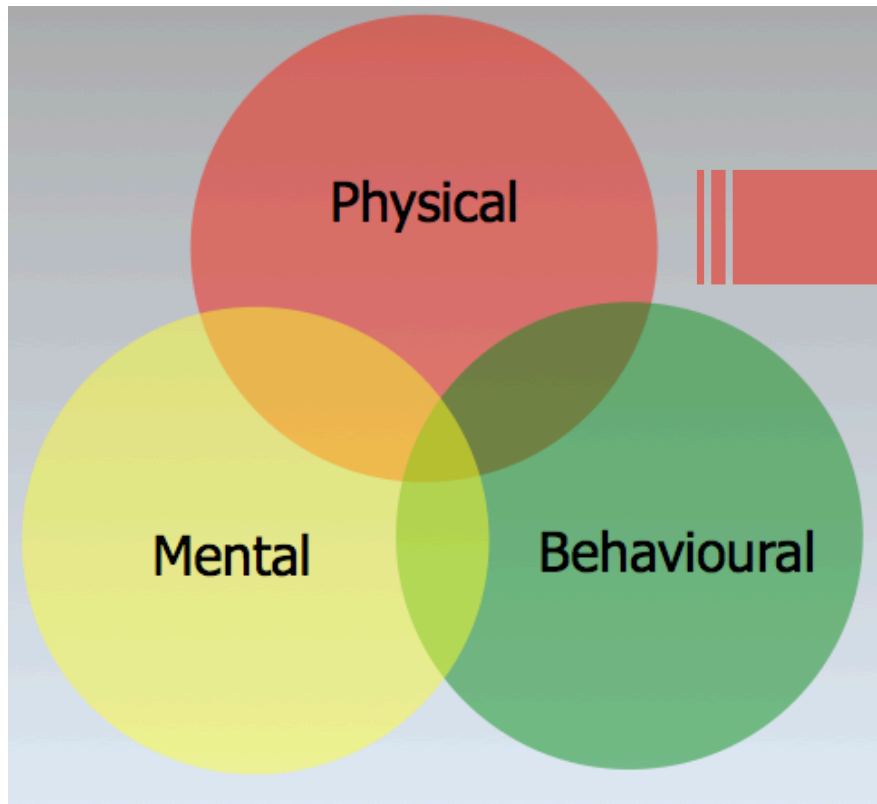
ALL TOGETHER, STRESS HAS A HUGE IMPACT ON ECONOMY AND SOCIETY AT LARGE

Gesundheitsbedingte Produktivitätsverluste

	Grüner Bereich Ressourcen > Belastungen	Sensibler Bereich Ressourcen = Belastungen	Kritischer Bereich Ressourcen < Belastungen	Alle
Absentismus (in % der Arbeitszeit)	2,94 %	2,92 %	4,72 %	3,38 %
Präsentismus (in % der Arbeitszeit)	5,47 %	9,38 %	14,74 %	9,64 %
Total gesundheitsbedingter Produktivitätsverlust (in % der Arbeitszeit)	8,41 %	12,3 %	19,46 %	13,02 %

Source: Gesundheitsförderung Schweiz (2016). Job-Stress-Index 2016 Kennzahlen zum Stress bei Erwerbstätigen in der Schweiz, Bern.

➡ Estimated CHF 6,5 bn productivity loss per year in Switzerland caused by stress-related absenteeism
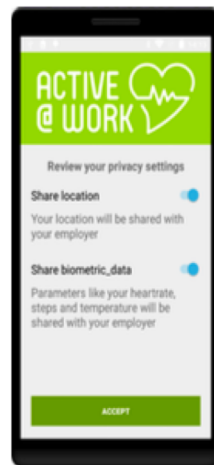
FNS SNF — SWISS NATIONAL SCIENCE FOUNDATION

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HOW DO THESE TECHNOLOGIES CHANGE THE RULES OF THE GAME?

consumer setting

devices provided by employer and used in an occupational health program

business setting

individual ↔ tech provider

organization ↔ tech provider

organization ↔ tech provider

individual

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SOME PERSONAL EXPERIENCES FROM DIFFERENT RESEARCH PROJECTS
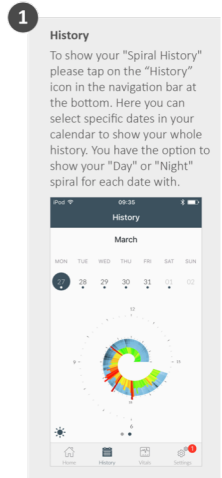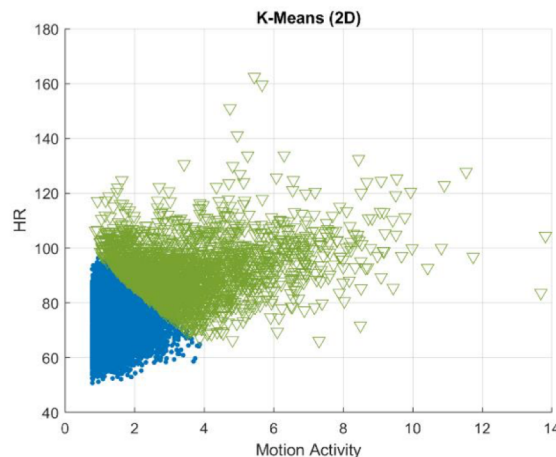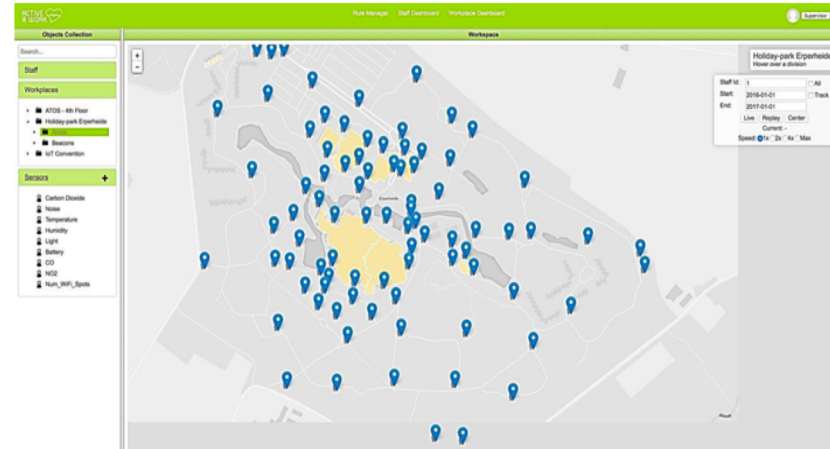
PHASE I-a: DEMONSTRATING THAT IT WORKS ON INDIVIDUAL LEVEL

A regular day at job *vs* just about a burnout

Right: 30 years old female medical doctor in a clinical environment after a 28 hours work input including a full night shift. Systematically elevated HR and BPw with little relaxation. Mentally and physically exhausted.
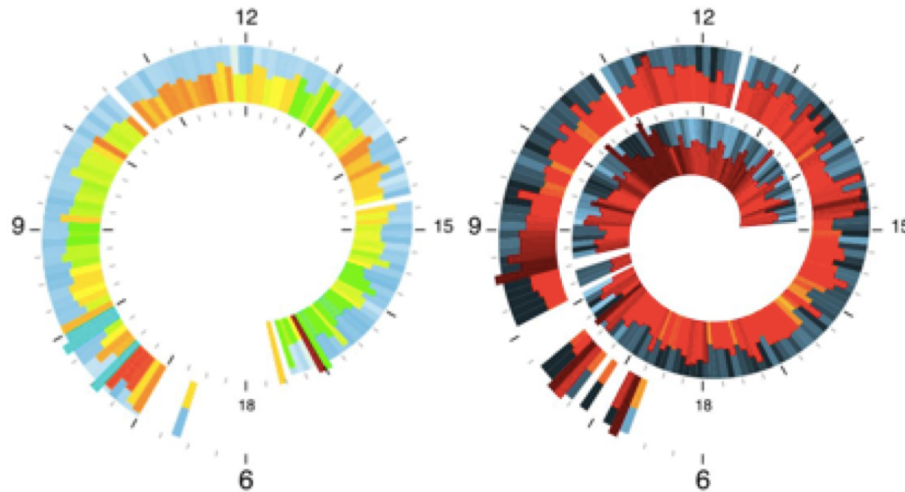
Left: 32 years old male scientist temporally working in a clinical environment. Engage in a hectic and clinical study day with a complex experimental procedure and sophisticated equipment. Person is highly focused for 8 hours.

PHASE I-b: DEMONSTRATING THAT IT CAN WORK ON ORGANIZATIONAL LEVEL

Source: Stepanovic, S., Mozgovoy, V., & Mettler, T. (2019). Designing Visualizations for Workplace Stress Management: Results of a Pilot Study at a Swiss Municipality. In *Proceedings of the International Conference on Electronic Government* (pp. 94-104).
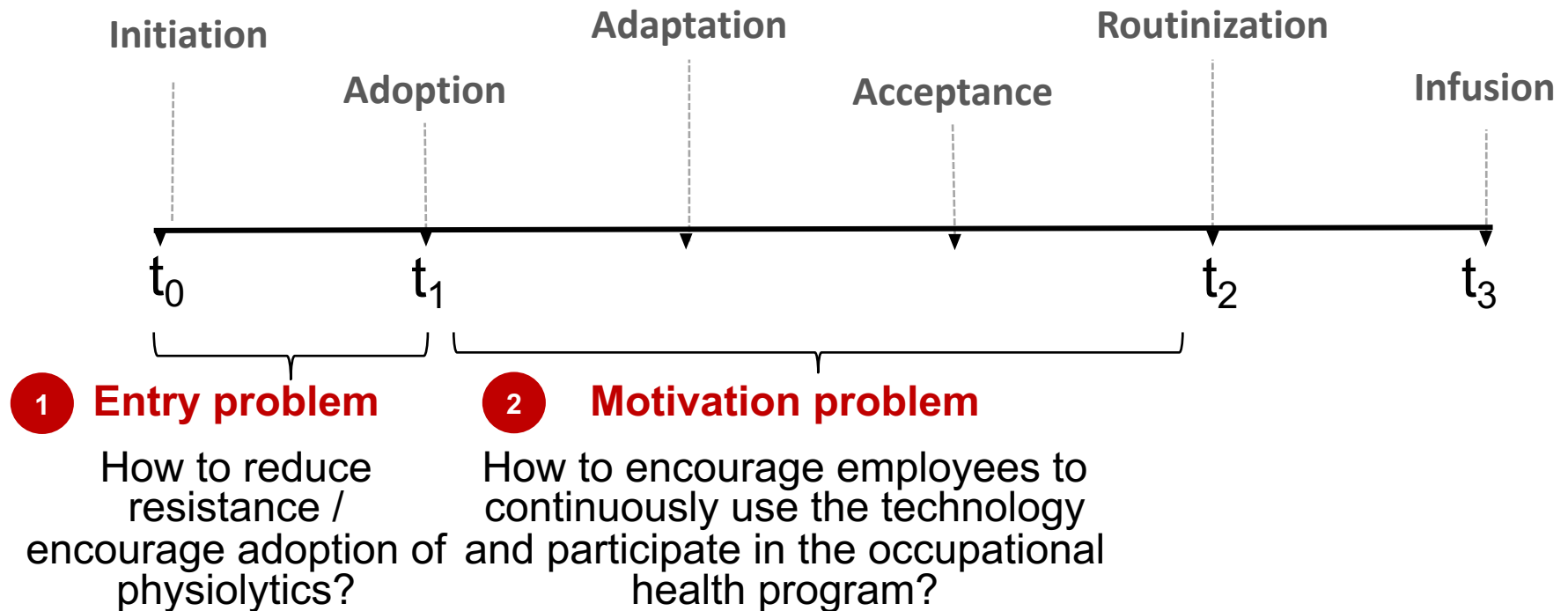
WORKING YES, BUT USABLE?

- **ACCURATE**: Measures and quantities have to be accurate, so that users are ensured that they can exploit the health information that is displayed.

- **EASY-TO-READ:** A visual salience between metrics is desired. Still, superfluous features (e.g. flashy colors) or unnecessary components (e.g. side illustrations) should be avoided, as it may interfere with cognition.

- **EASY-TO-UNDERSTAND**: Visualizations have to disseminate information to the general public. Users are not likely to be data scientists.

- **CLEAR AND CONCISE**: Too much information may hinder cognition.

- **LOGICAL**: Visualizations have to be organized in a simple and logical way, so that users can promptly perceive the information displayed.

- **MEANINGFUL TO TARGET AUDIENCE**: The information provided has to resonate in the context of target audience.

- **ALLOW COMPARISON**: Visualizations have to make it possible to easily compare quantities, relationships etc.

- **CONVINCING**: Visualizations should nudge users in exploiting the information.

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PHASE II: FIXING SOCIAL, ETHICAL, AND LEGAL CHALLENGES

Initiation **Adaptation** **Routinization**

Adoption **Acceptance** **Infusion**

t_0 t_1 t_2 t_3

1 **Entry problem**

How to reduce resistance / encourage adoption of physiolytics?

2 **Motivation problem**

How to encourage employees to continuously use the technology and participate in the occupational health program?

ENTRY PROBLEM: FOOD FOR THOUGHT

- VOLUNTARY VS. MANDATORY USE: Using "security" as argument for surveillance in certain jobs (e.g. air traffic controller, firemen) → analogy to video surveillance

- DATA OWNERSHIP: Who owns the data? Where is it stored? What can companies do with it?

- CONSEQUENCES OF NON-ADOPTION: In certain countries, the employer determines if you get a health insurance or not → higher health premiums or non-coverage

- SOCIAL PRESSURE AT THE WORKPLACE: "everybody wears one", "what are you hiding?"

- ➡ New theories that explain technology adoption in a fuzzy private-business setting are needed

ENTRY PROBLEM: FOOD FOR THOUGHT

SOME INTERESTING PROBLEMS TO WORK ON:

- Multi-trust problem: do I trust all the ecosystem players (i.e. technology provider, employer, third-parties...)

- Social cheating: how does the organization prevent others to cheat?

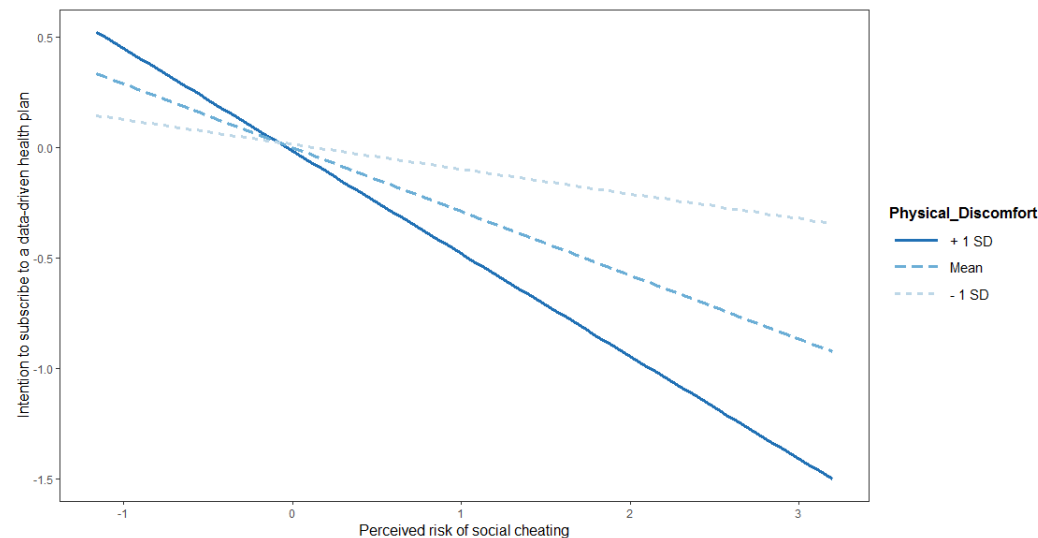- Preventive behavior: why participate when I feel healthy?

- ...

Health promotion with physiolytics: What is driving people to subscribe in a data-driven health plan

Tobias Mettler [1]*, Jochen Wulf[2]

1 Swiss Graduate School of Public Administration, University of Lausanne, Lausanne, Switzerland,
2 Institute of Information Management, University of Gallen, St. Gallen, Switzerland

Source: Mettler, T., & Wulf, J. (2020). Health promotion with physiolytics: What is driving people to subscribe in a data-driven health plan. *Plos one*, *15*(4), e0231705.
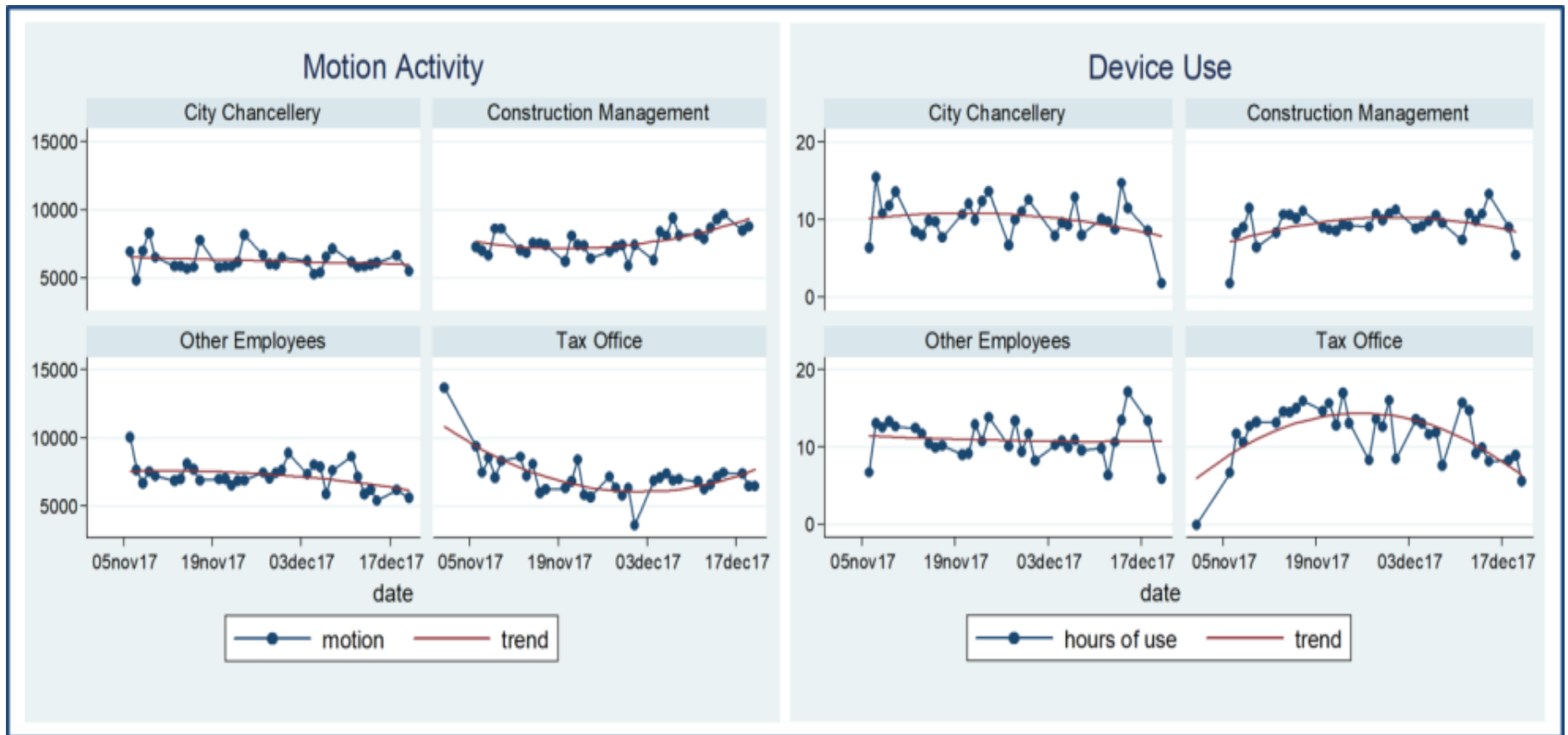
MOTIVATION PROBLEM: FOOD FOR THOUGHT

Use of preventive health apps is not a sprint, it's rather a marathon

Source: Stepanovic, S., Mozgovoy, V., & Mettler, T. (2019). Designing Visualizations for Workplace Stress Management: Results of a Pilot Study at a Swiss Municipality. In *Proceedings of the International Conference on Electronic Government* (pp. 94-104).
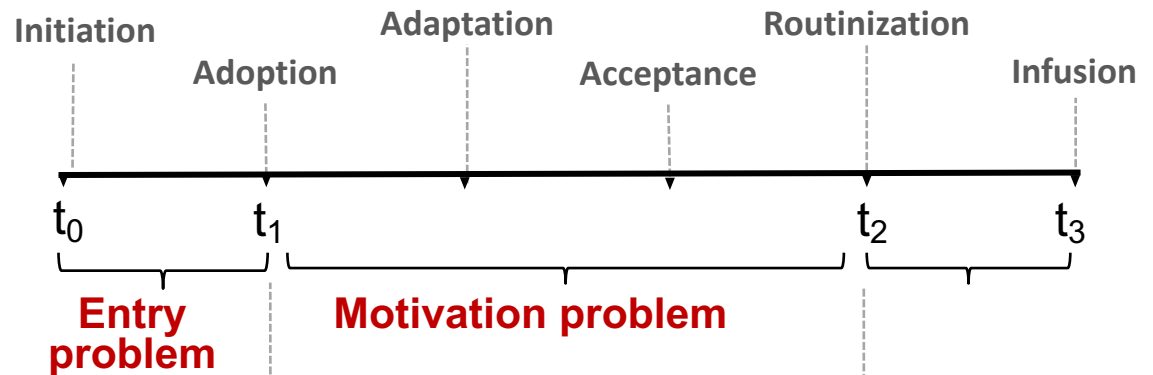
MOTIVATION PROBLEM: FOOD FOR THOUGHT

Use of preventive health apps is not a sprint, it's rather a marathon

Initiation   Adaptation   Routinization

Adoption   Acceptance   Infusion

t_0 t_1 t_2 t_3

Entry problem   **Motivation problem**

Sprint distance (100m)

Medium distance (1500m)

Long distance (42 km)
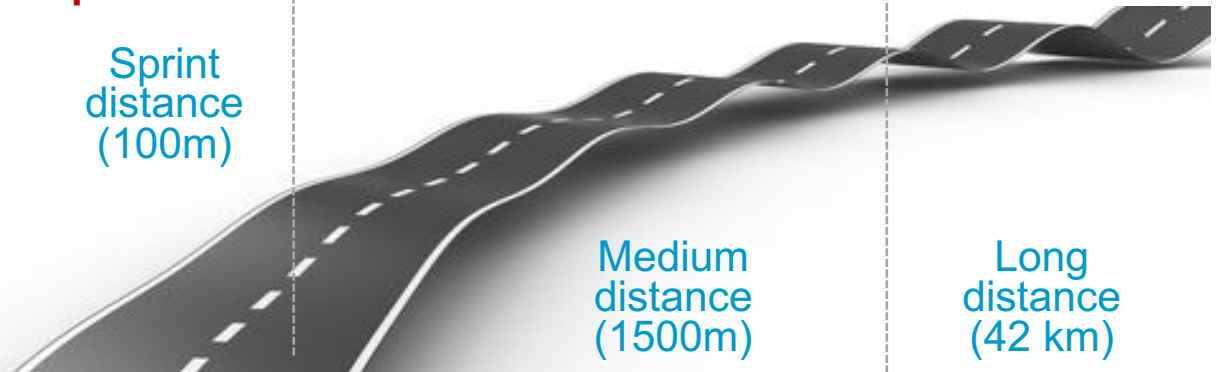
WHAT IF GAMIFICATION DOESN'T WORK?

- **WEAK EVIDENCE BASE**: Only a handful research studies that measured effects over a period longer than a couple of weeks

- **ONE-SIZE DOESN'T FIT ALL**: People react differently to different cues; impossible to making everybody happy without making things too complicated
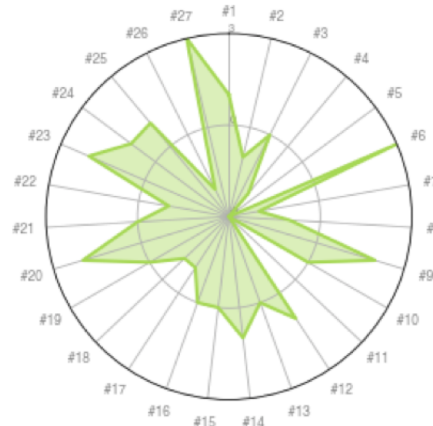
See: Stepanovic, S., & Mettler, T. (2018). Gamification applied for health promotion: does it really foster long-term engagement? A scoping review. In *Proceedings of the 26th European Conference on Information Systems* (pp. 1-16).

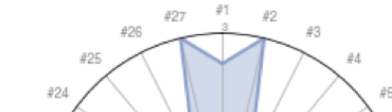# WHAT IF NUDGING RAISES ETHICAL CONCERNS?

Positive reinforcement and fun
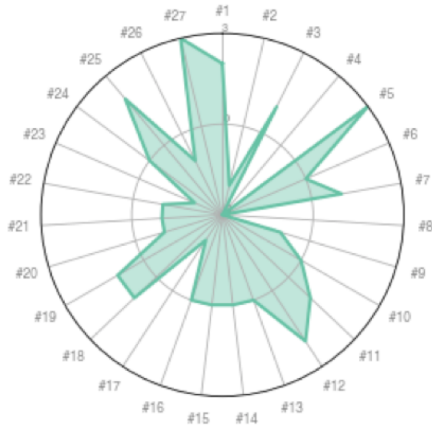
Personal commitment and self-responsibility

Controlling organizational environment

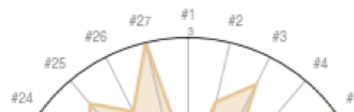Group effort and collective responsibility

Adapting the individual environment

- **DIFFERENT CONCERN LEVELS**: People are not *per se* against nudging, but express concerns about the "nature" of nudges
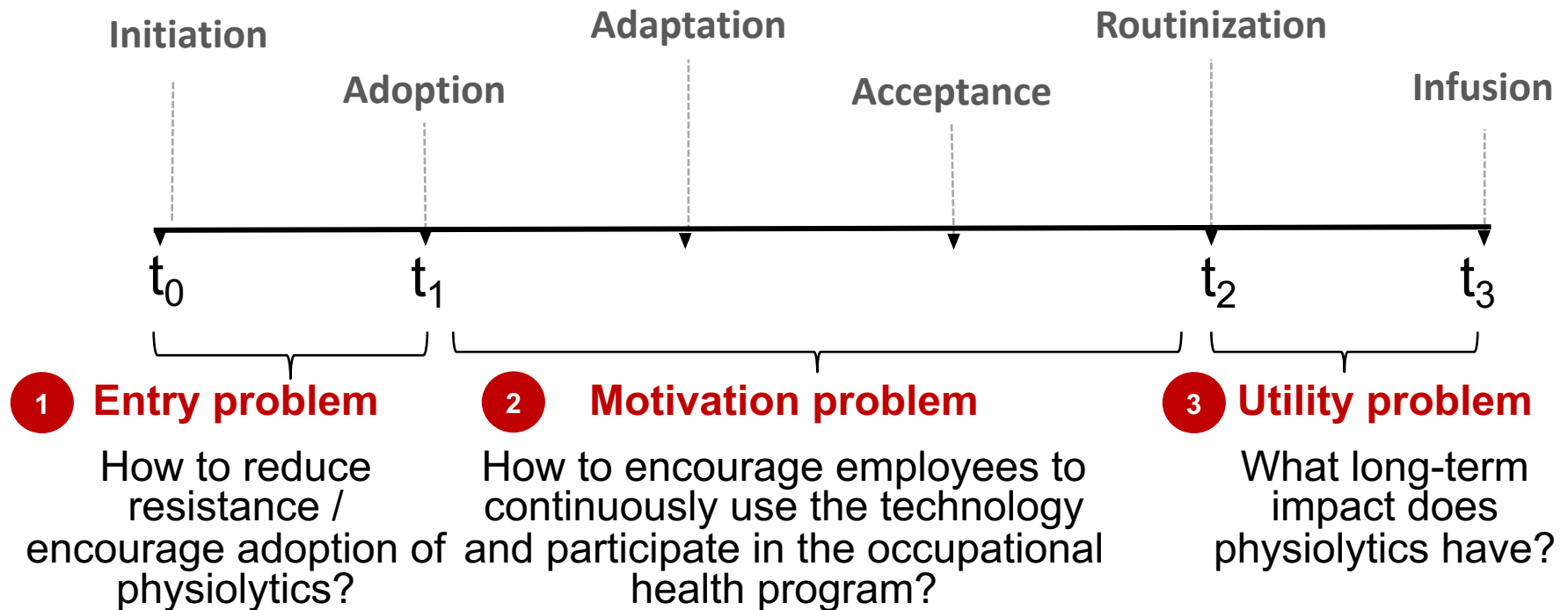
➡ New (ethical) design principles and (really long-term) evidence concerning the effects of UX needed

PHASE III: ACCOUNTABILITY OF TECHNOLOGY

Initiation   Adaptation   Routinization

Adoption   Acceptance   Infusion

t_0 t_1 t_2 t_3

1 **Entry problem**

How to reduce resistance / encourage adoption of physiolytics?

2 **Motivation problem**

How to encourage employees to continuously use the technology and participate in the occupational health program?

3 **Utility problem**

What long-term impact does physiolytics have?

UTILITY PROBLEM: TECHNOLOGY AS HOLY GRAIL

Image from *Indiana Jones and the Last Crusade*

WHICH SIDE WILL PREVAIL: THE BRIGHT OR THE DARK SIDE?

THANK YOU FOR YOUR ATTENTION

INFORMATION MANAGEMENT @IDHEAP

Prof. Dr. Tobias Mettler

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Swiss Graduate School of Public Administration

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