

BayesInsights: Modelling Software Delivery and Developer Experience with Bayesian Networks at Bloomberg

Serkan Kirbas¹ Federica Sarro^{1,2} **David Williams**^{1,2}

¹Bloomberg

²University College London

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Developer experience at Bloomberg

Thousands of engineers working in diverse contexts

Quarterly developer experience (DevEx) surveys

Likert-scale questions about:

- Job satisfaction
- Dev. environment performance
- Time lost to obstacles
- Other factors from SPACE, DORA, etc.

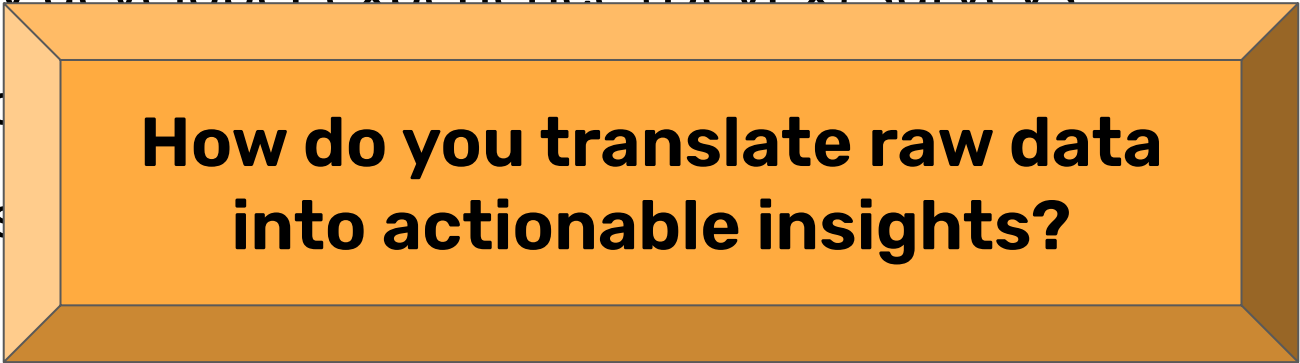
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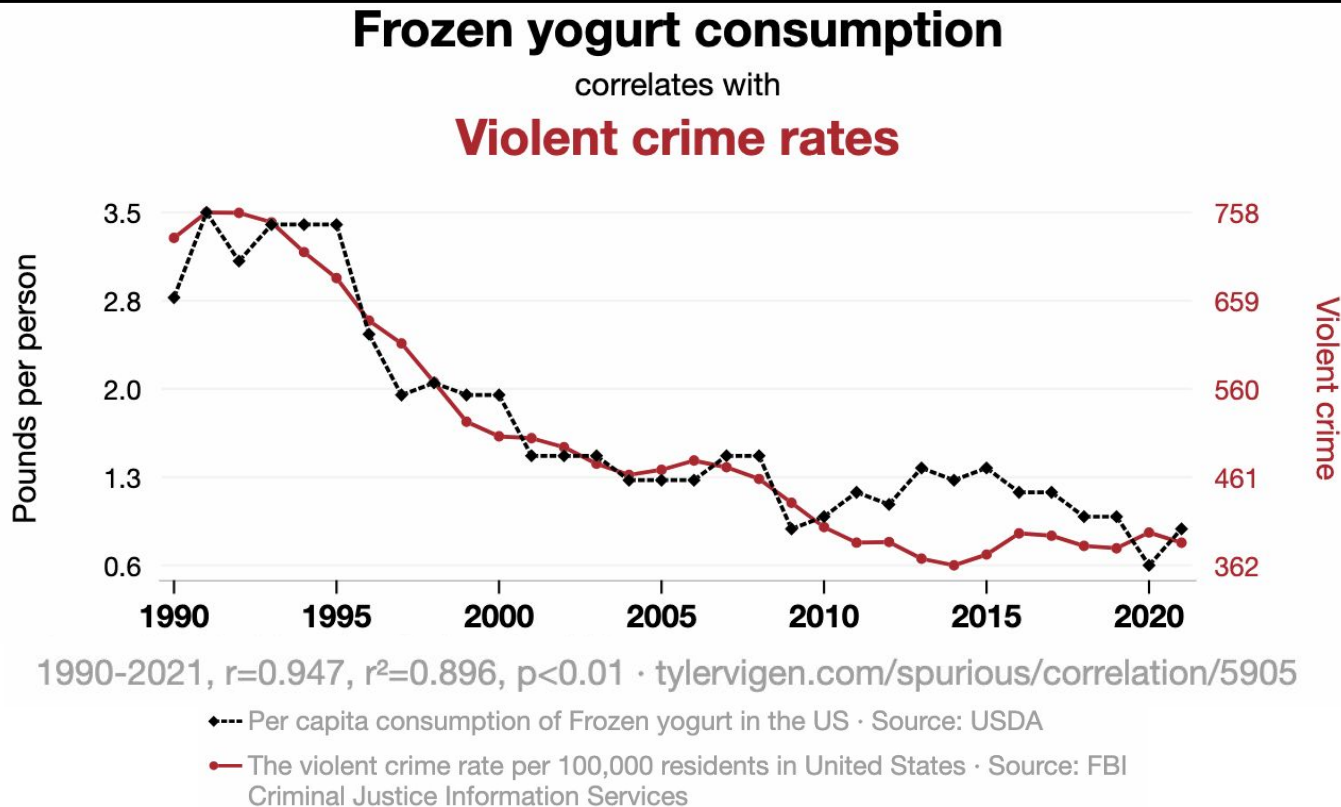
Likert-scale

- Job satisfaction
- Dev. environment
- Time lost to obstacles
- Other factors from SPACE, DORA, etc.



**How do you translate raw data
into actionable insights?**

Correlations can't always paint a full picture



The same goes for SE metrics

Imagine the rate of releases has decreased for a team, is this because:

- The team members are **less productive** than before?

Or is it because of:

- New organisational policies?
- Changes in team headcount?
- **Improvements** in CI/CD check robustness?

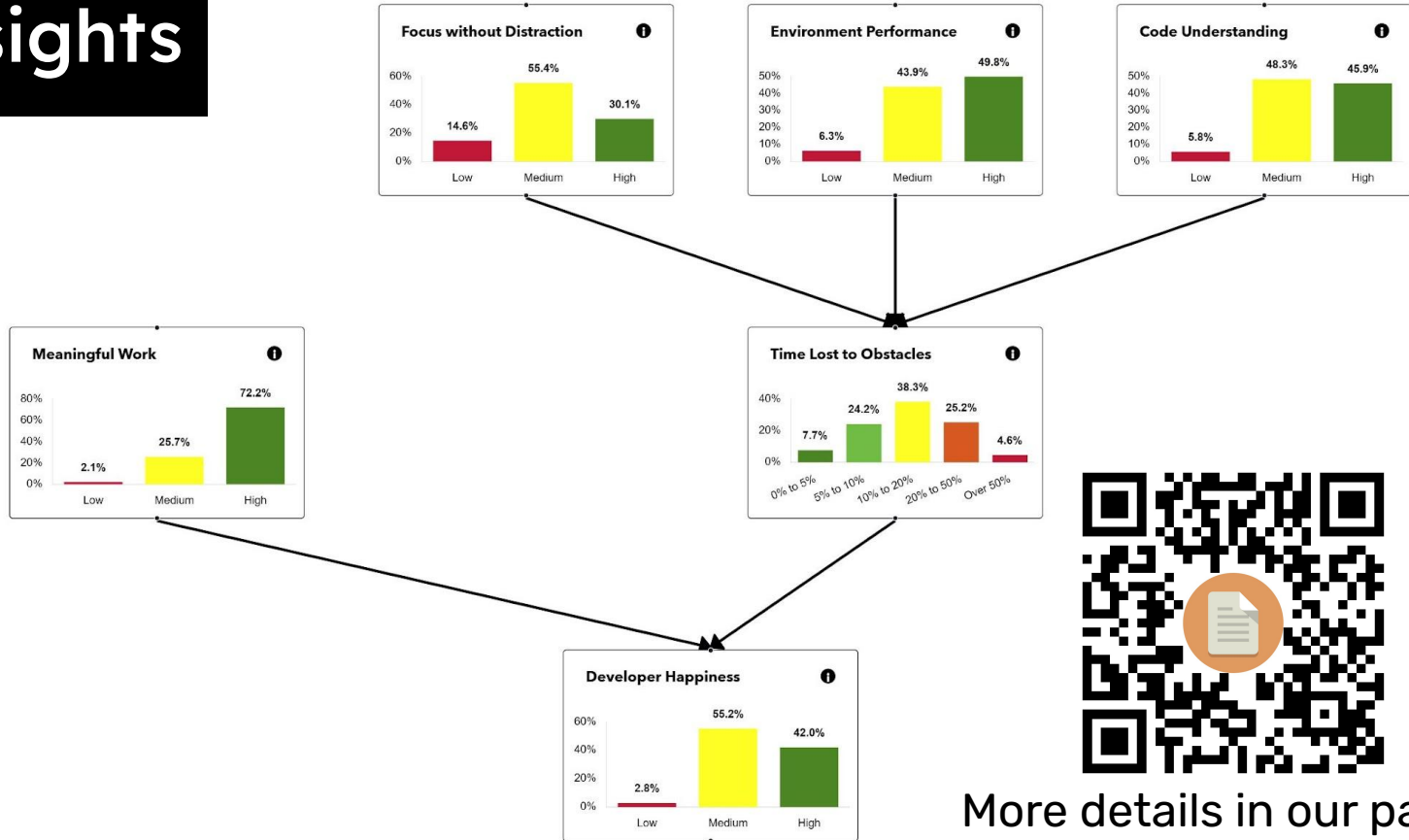
A solution: Bayesian networks for causal modelling

Bayesian Network (BN): a probabilistic graphical model mapping variables (nodes) and their conditional dependencies via a Directed Acyclic Graph (DAG).

How BNs solve the dashboard problem:

- Explicitly model how factors interact
- Supports both forward and backward causal reasoning (“what if?” scenario analysis, root-cause identification)
- Robust under uncertainty and noisy data (i.e. from surveys)

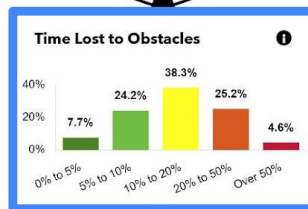
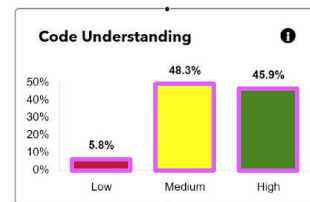
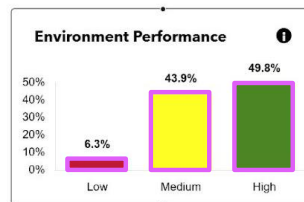
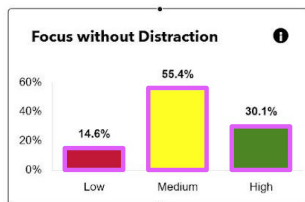
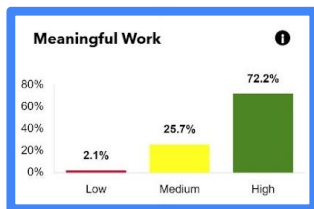
Our tool: BayesInsights



More details in our paper!

Our tool: BayesInsights

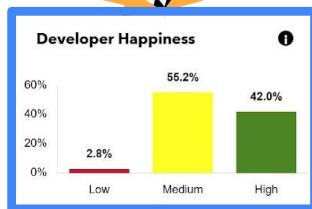
Each box (node) is a
survey question



Each bar (state) is
a question option



More details in our paper!

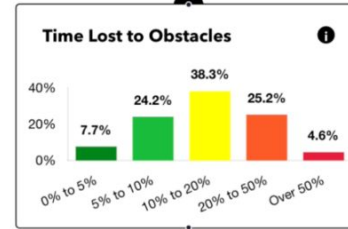
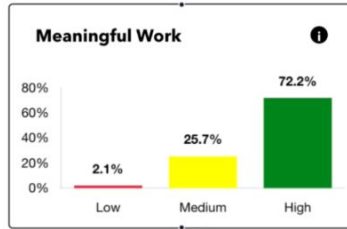
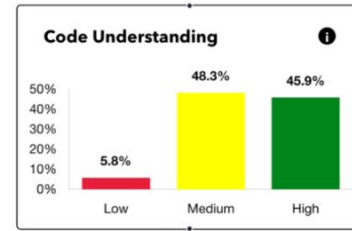
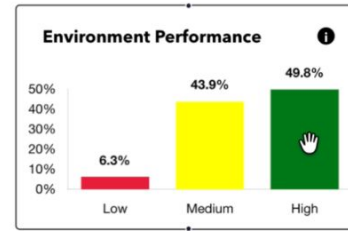
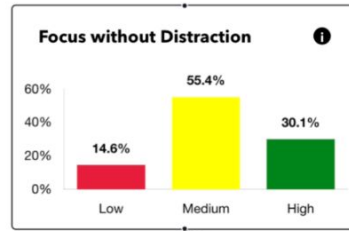


Each link is hypothesised via literature
structure-learning algorithms, then
validated with expert opinion

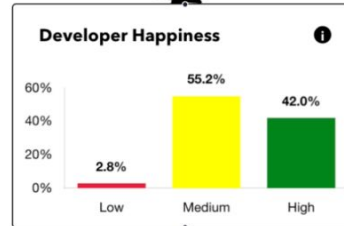
BayesInsights Visual Demonstration

Forwards and Backwards Causal Analysis

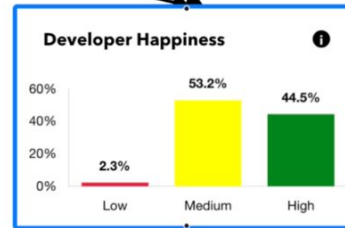
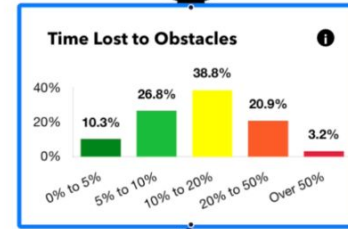
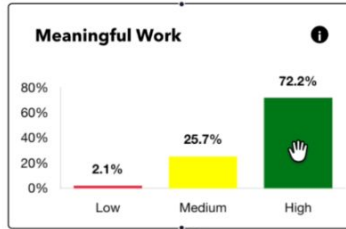
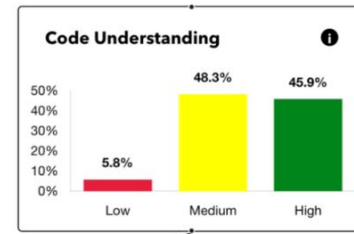
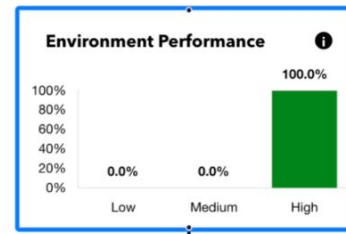
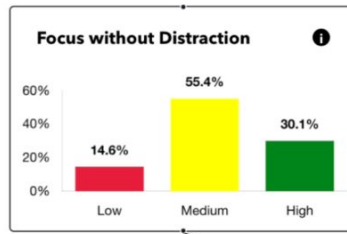
“What if?” Forwards



“If my engineers had great dev environments and found their work meaningful, how would that affect their happiness and time wasted?”

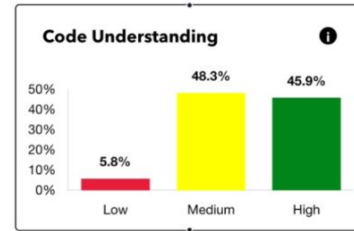
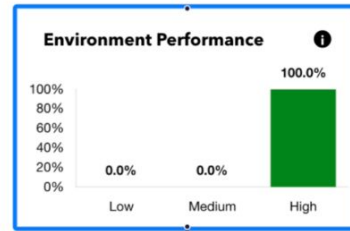
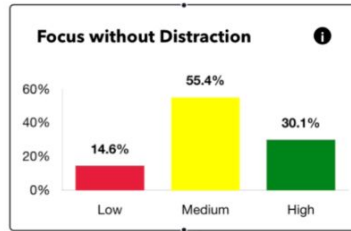


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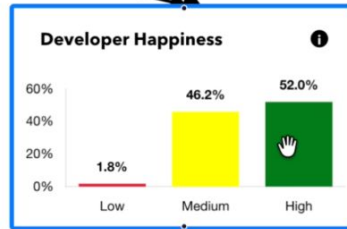


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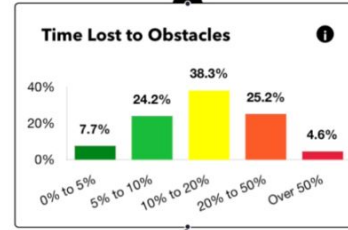
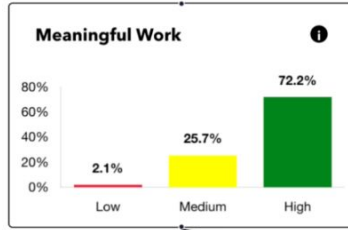
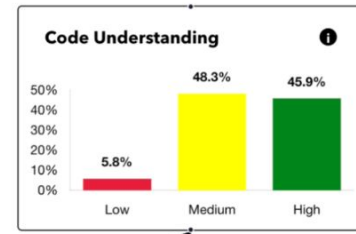
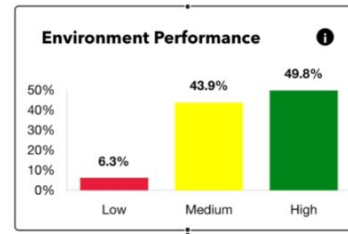
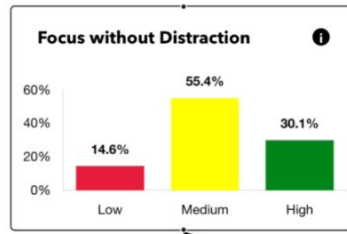
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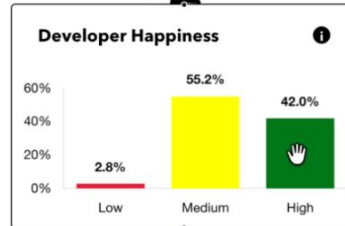
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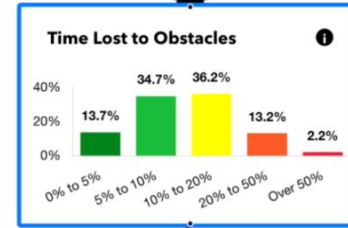
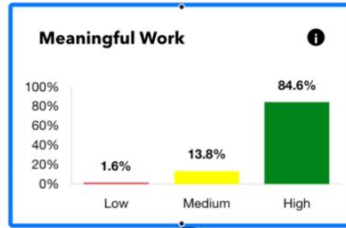
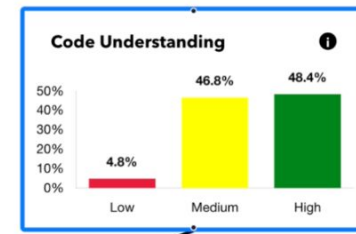
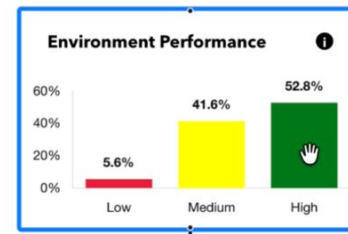
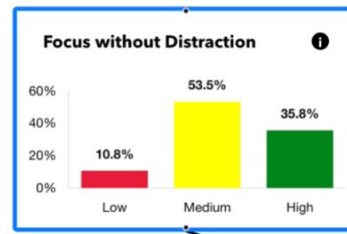
“What if?” Backwards



“If all my engineers were happy, which factors would have contributed to that?”



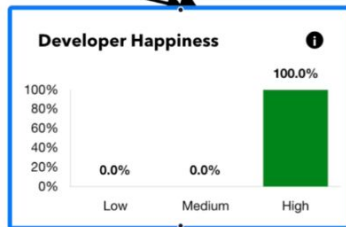
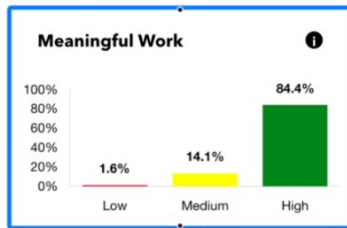
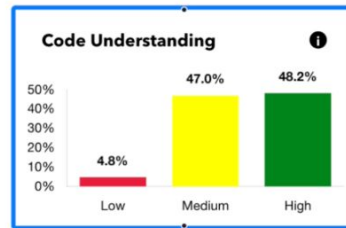
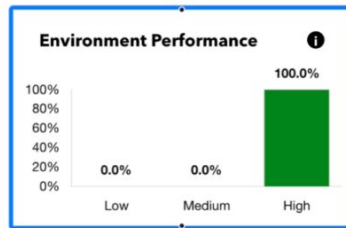
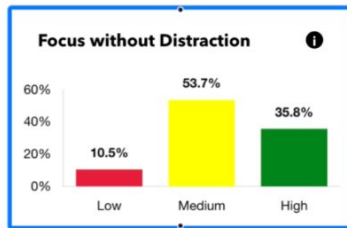
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Evaluation with Managers and Team Leads

Part 1: Methodology & Demographics

Focus group sessions

Explaining motivation & purpose of BayesInsights

Interactive demo and feedback survey

24 responses

21 with >10 years of experience

Team leads, software/product managers, senior software engineers

Evaluation with Managers and Team Leads

Part 2: Key Findings



96% (23/24)

Found it useful for identifying team & organizational bottlenecks



79% (19/24)

Would actively use or recommend it to their own teams



75% (18/24)

Thought outputs were easy to interpret

How could Bayesian Networks help you in SE?

Find out in the full paper!

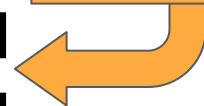
BayesInsights is now available to multiple teams.

The (short!) paper contains a guide for how to:

1. Motivate Bayesian networks for modelling SE.
2. Design networks using literature, expert insight and structure-learning algorithms.
3. Pick the right tech to implement your tool.
4. Evaluate the practical benefits of your new Bayesian Network-based tool!



Full paper:
arxiv.org/abs/2603.29929



Contact me:
david.williams.22@ucl.ac.uk
davejjwilliams.github.io

