

Developer Experience (Dev-X)

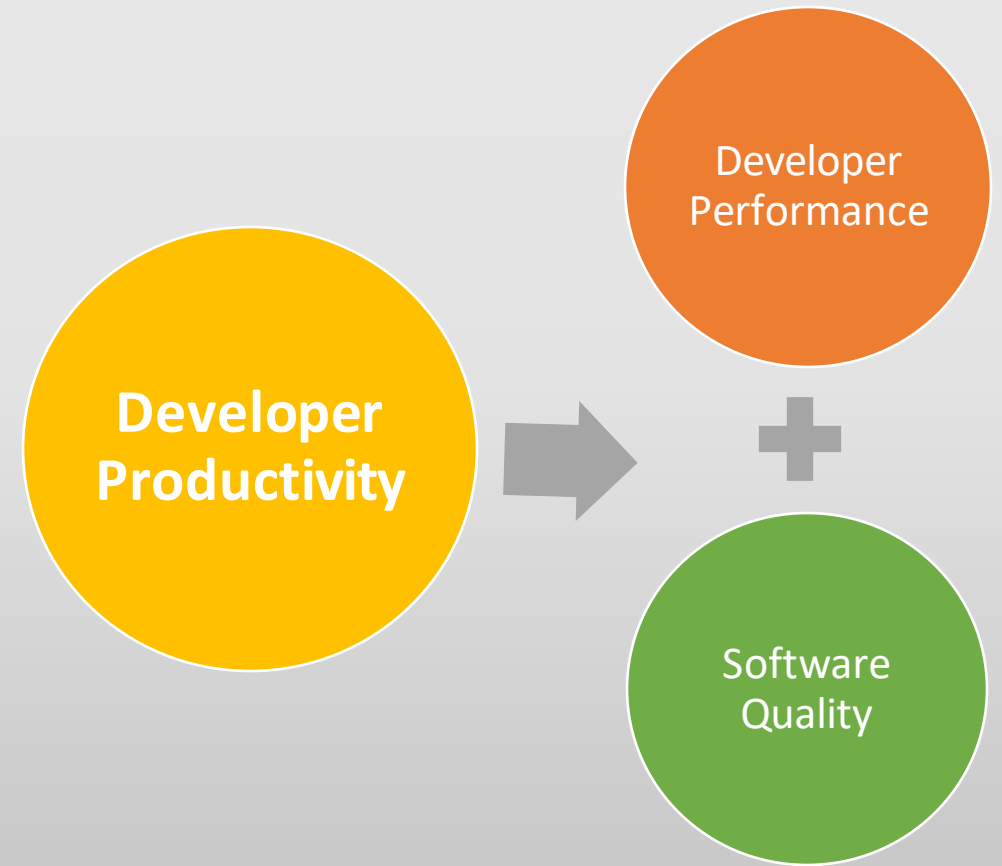
Towards Improving Developer Productivity through Human Factors

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School of Computing

Developer Experience (Dev-X): Where Does it Lie?

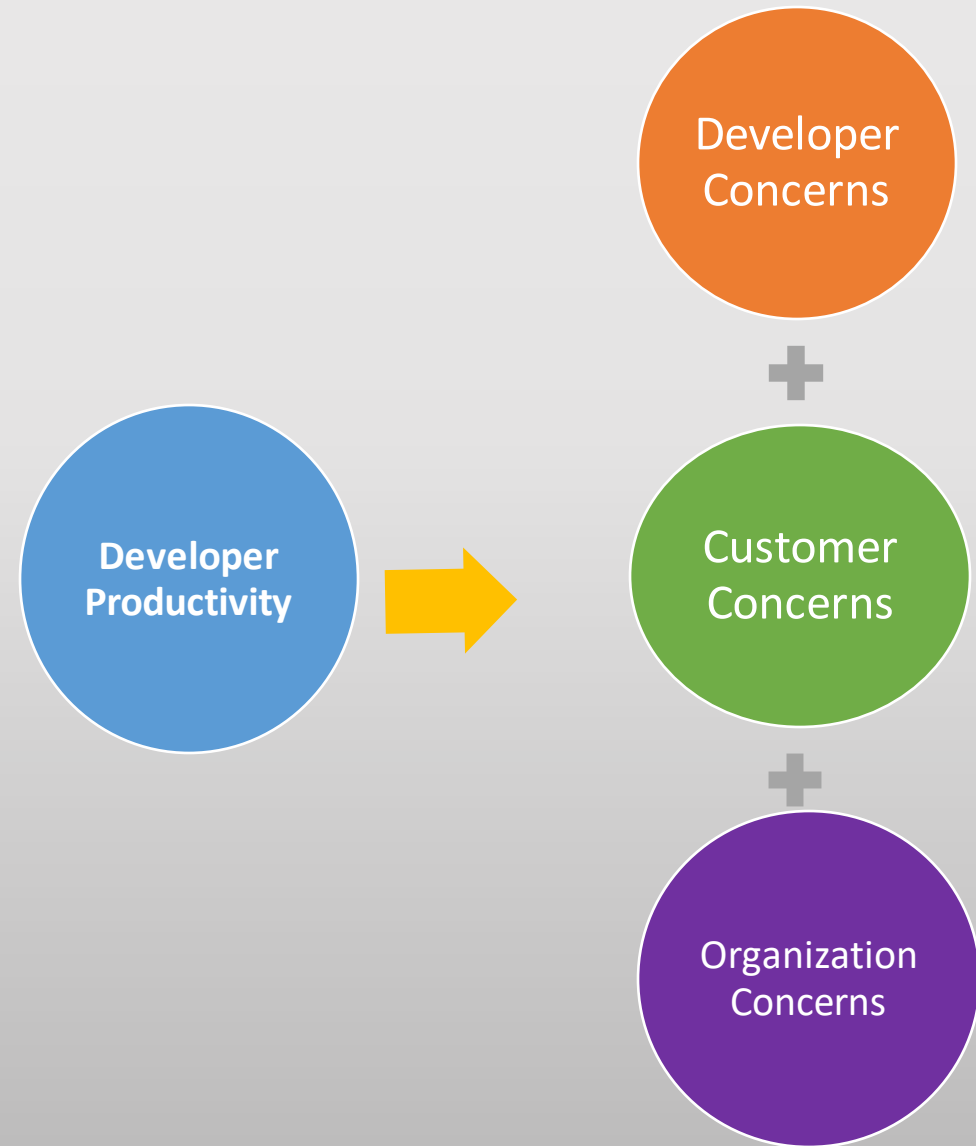
- Customer's Concerns
 - Quality of Software
- Organizational Concerns
 - Speed of Delivery



Developer Experience (Dev-X): Where Does it Lie?

- Developers' Concerns
 - Developer Emotions
 - Developer Values
 - Developer Perceptions

Developer eXperience (Dev-X), is a developer-centered concept that aims to drive developers' performance and software quality using a focus on developers' perceptions, feelings, and values



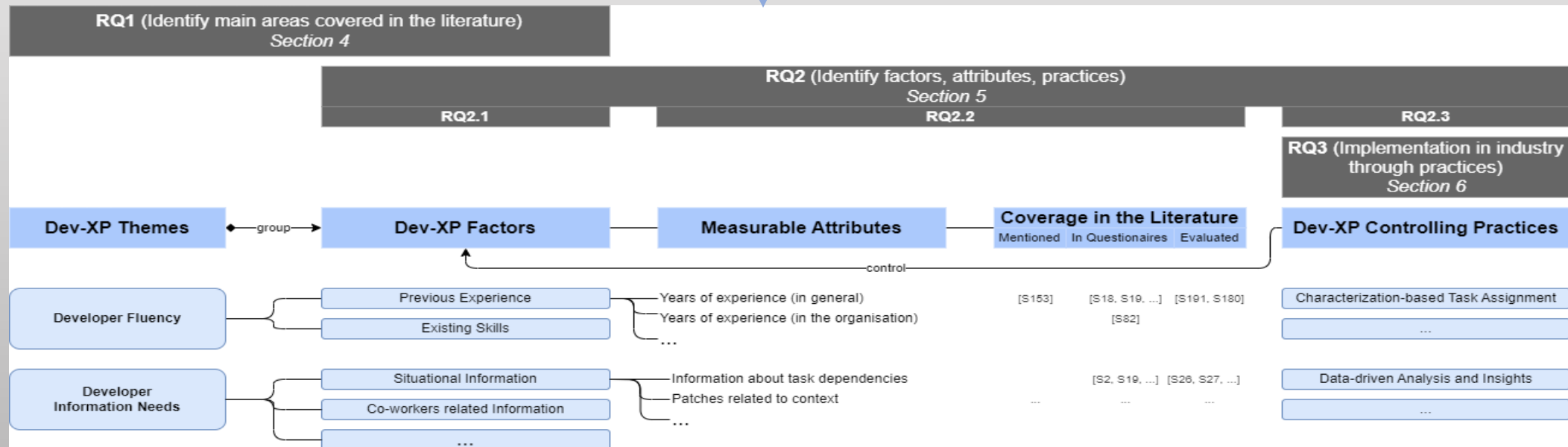
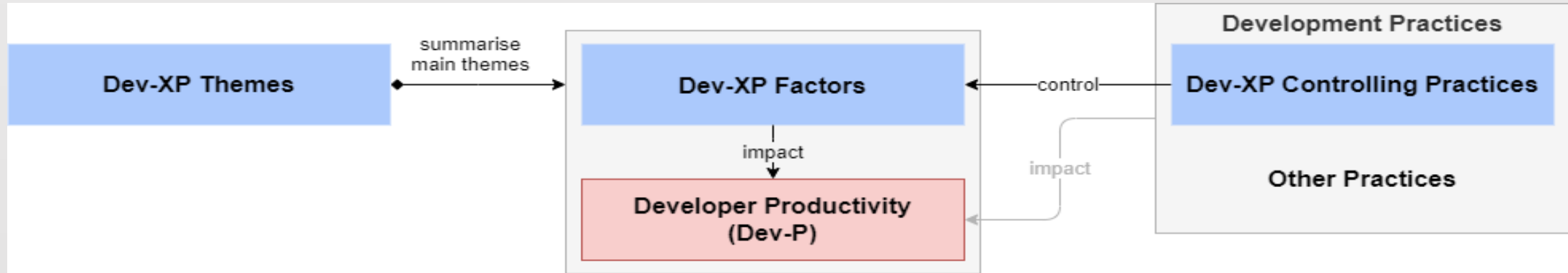
Research Partition

Taxonomy and
Characterization of Dev-X

Conceptualization of Dev-X
Evaluation Model

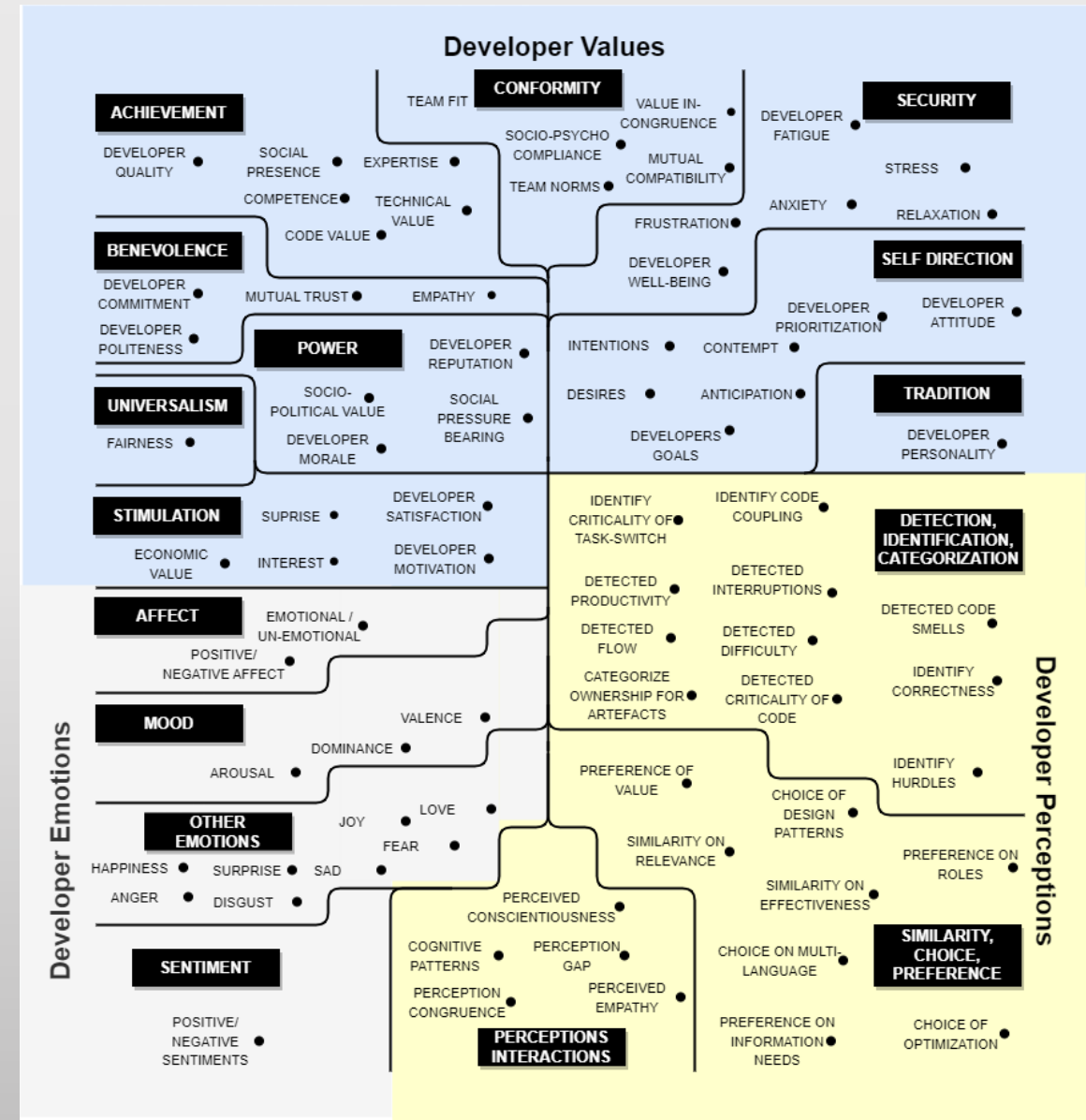
Assessment of Dev-X in
relation to Productivity

Characterization of Dev-X

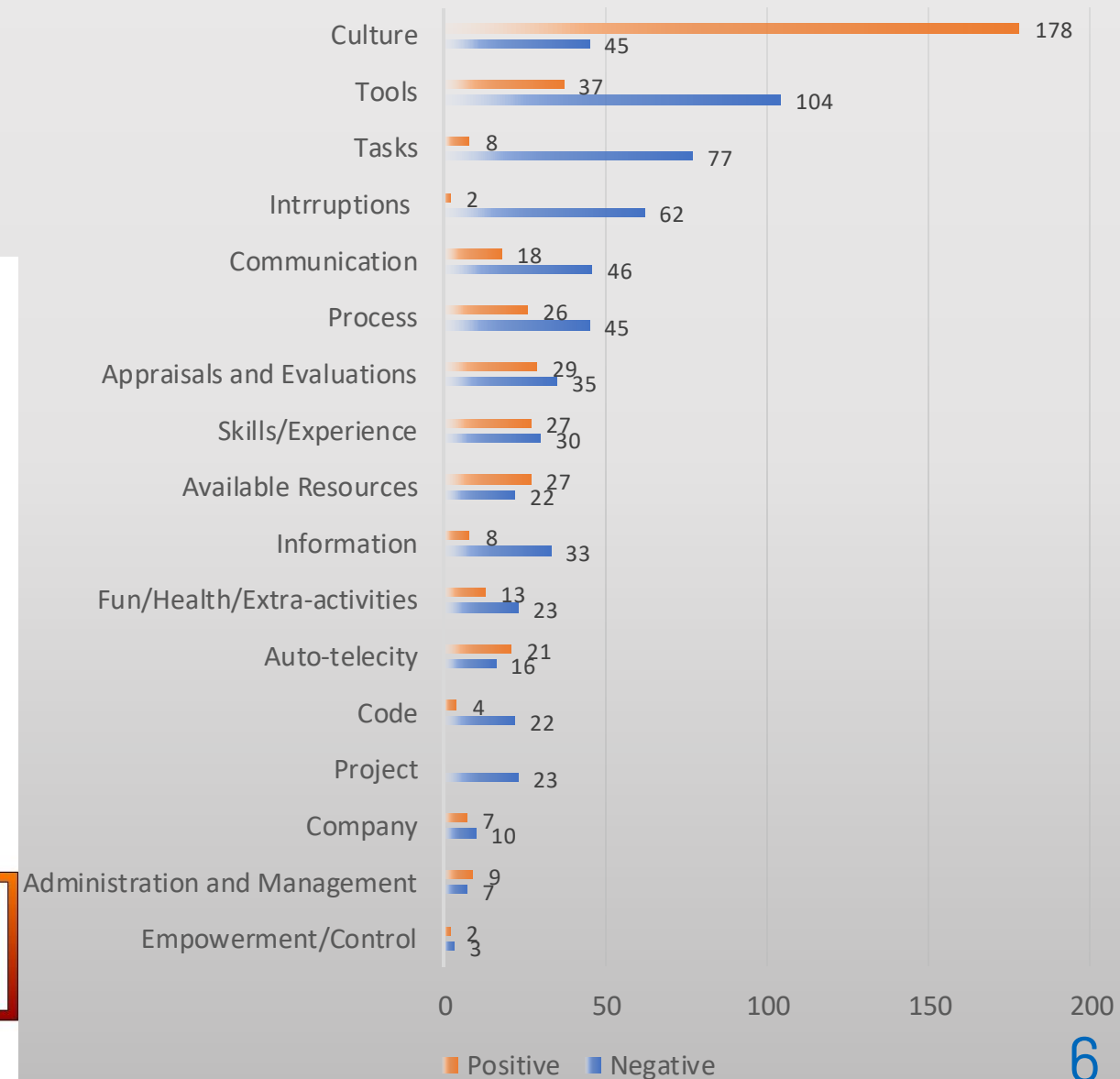
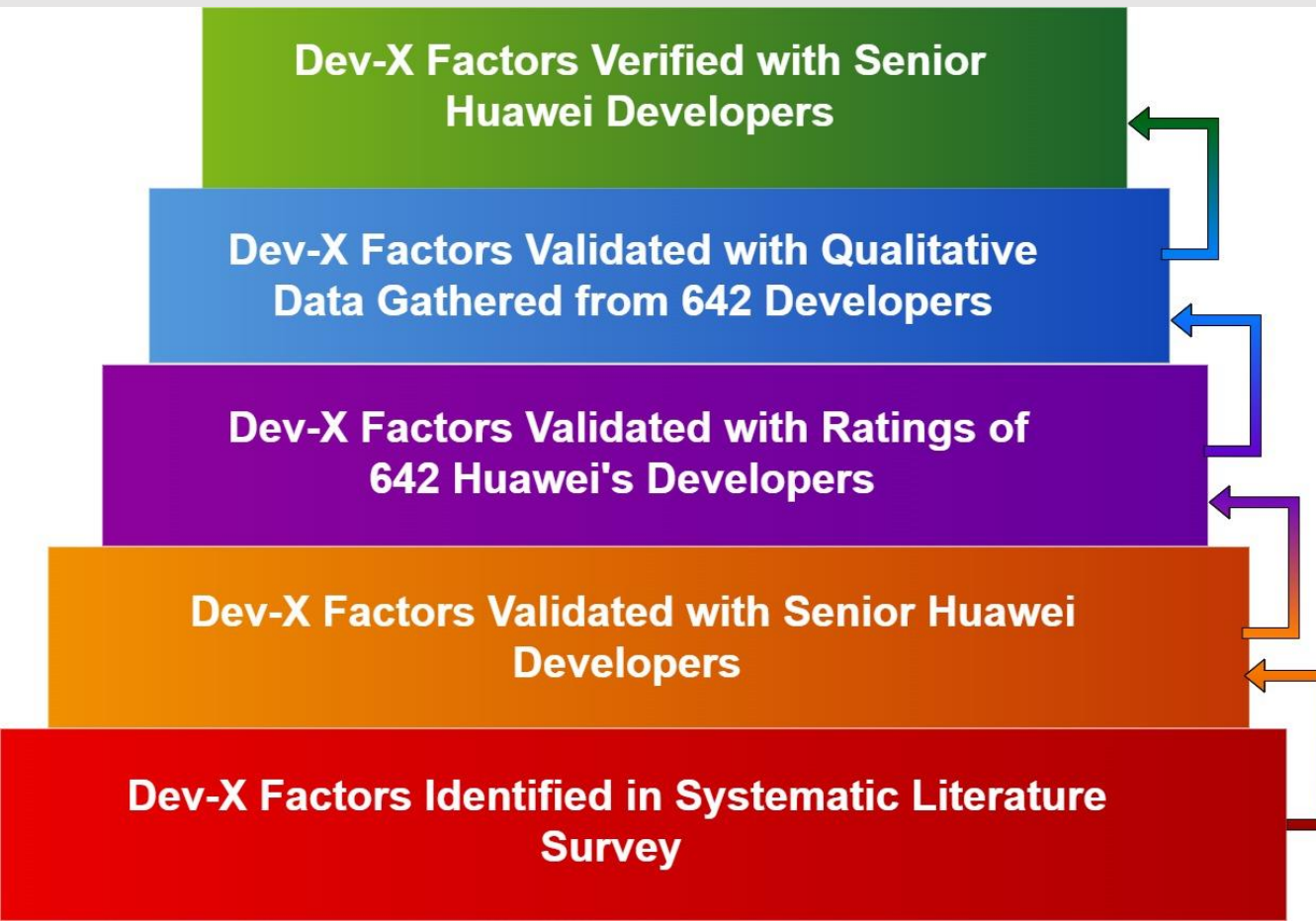


Dev-X Dimensions

- **1. Cognition**
 - How the developers perceive the objects (i.e., tools, techniques, artefacts, or technical environment) or processes/methods they experience and the activities (e.g., code comprehension) they perform.
- **2. Affect**
 - How the developers feel about the objects or processes/methods they experience and the activities they perform.
- **3. Conation**
 - How the developers see their values embodied in experiencing some objects or processes/methods/activities they perform.



Factors Impacts Real Developers: Thematic Analysis



Characterization Takeaway

Top Positive Factors

1. Team Culture
2. Situation Awareness
3. Regular Reviews
4. Technical Support

Top Negative Factors

1. Interruptions
2. Work Contexts
3. Project Alterations
4. Code Complexity

Highly Impactful Factors

1. Team Culture
2. Technical Support
3. Effective/Timely Communication
4. Code Sharing/Scatting
5. Awareness Situation

- Productivity and Dev-X are Highly Correlated
- All Factors are Important but Every Dev-X Factor Impacts Different Set of Productivity Factors
- Increase in Number of Years Experience at Huawei is Positively Correlated with Dev-X and Productivity

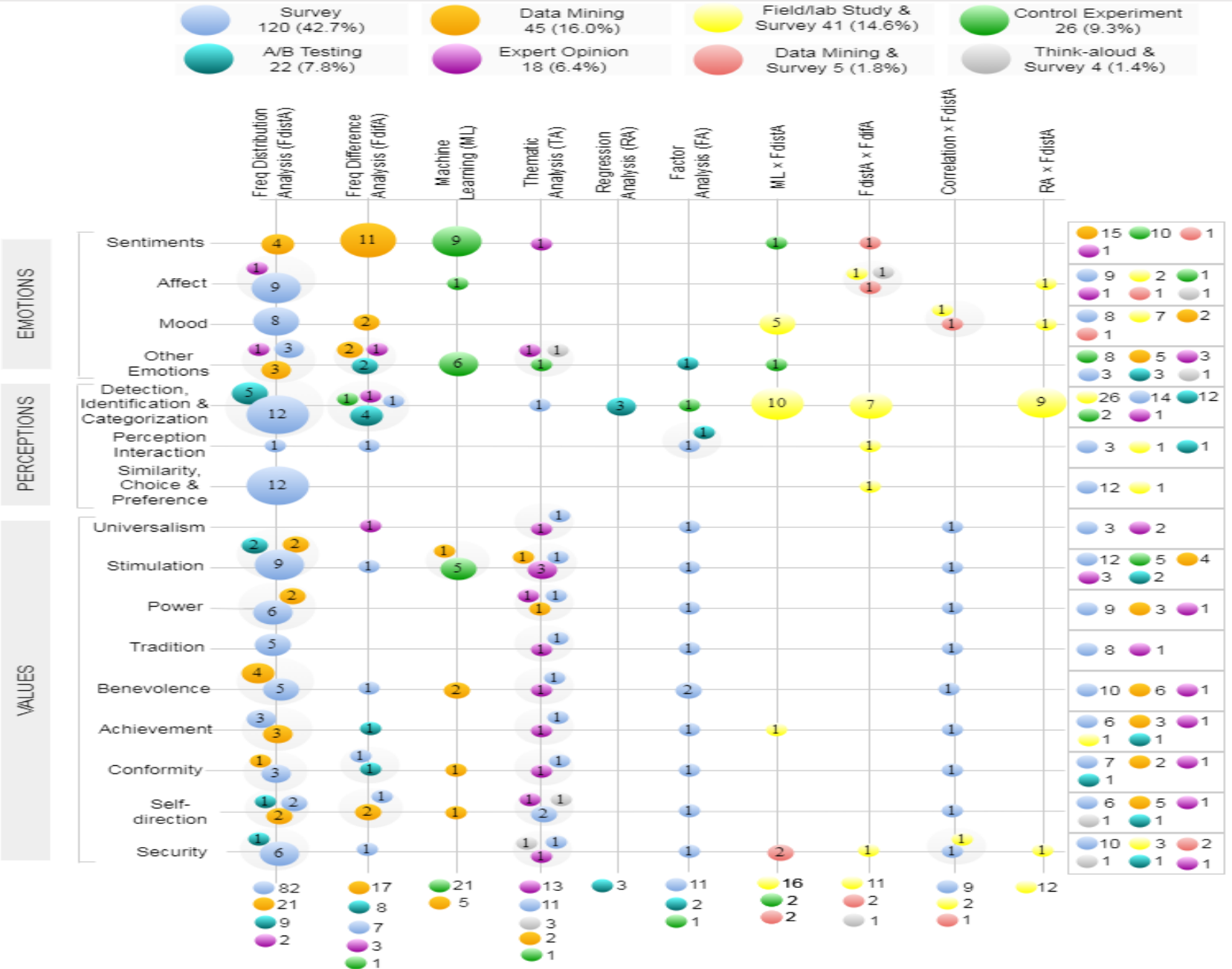


Conceptualized Dev-X Evaluation Model

Metrics and Data Types to Assess Dev-X

	Developer Emotions	Developer Perceptions	Developer Values
Data Type	1) VCS repository data 2) Issue Tracking repository data 3) Developer rating data	1) Developer rating data 2) VCS repository data 3) Project history data	1) Developer rating data 2) VCS/Issue-tracking repository data 3) Project history data
Metrics	1) Sentiment (Senti-strength) score of bug reports and commit messages 2) Developer rating using scale of Positive and Negative Experience (SPANE) 3) ML algorithms in detecting emotions from project history of messages data	1) Developer ownership (of some task or artefact) based on hub score (SNA metric) 2) High/low conscientiousness as measured by rating 3) NASA Task Load Index	1) Metrics to assess values encoded in textual data: politeness, trust, stress, social, and achievement 2) Developer ratings for values: politeness, trust, stress, social, cognitive, and achievement 3) SNA metrics (homophily, shared affiliation and developer degree) to assess multiple values

Metrics Used in Assessing Dev-X

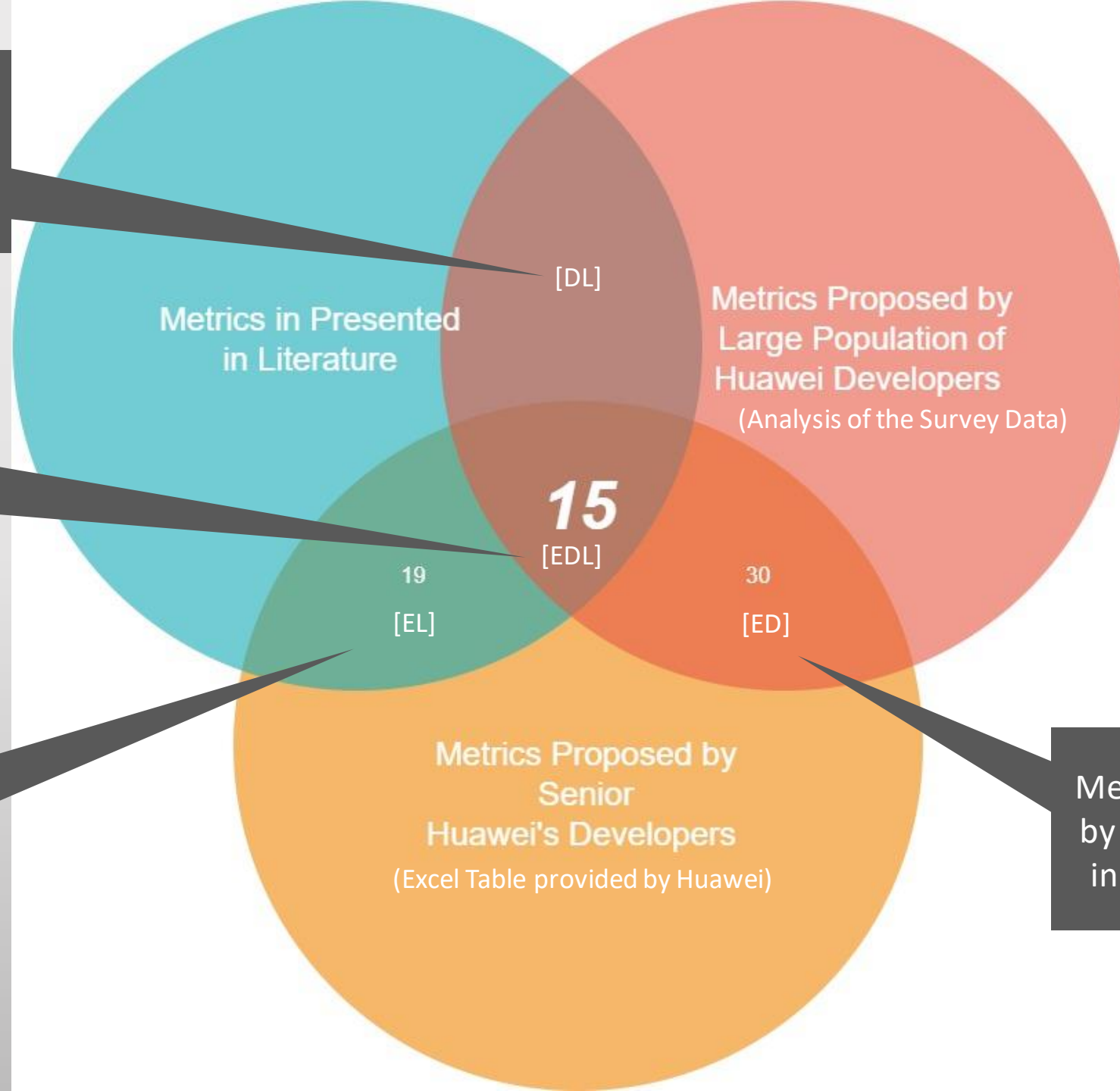


Metrics mentioned
by Developers and
in the Literature

Metrics mentioned
in all 3 sources

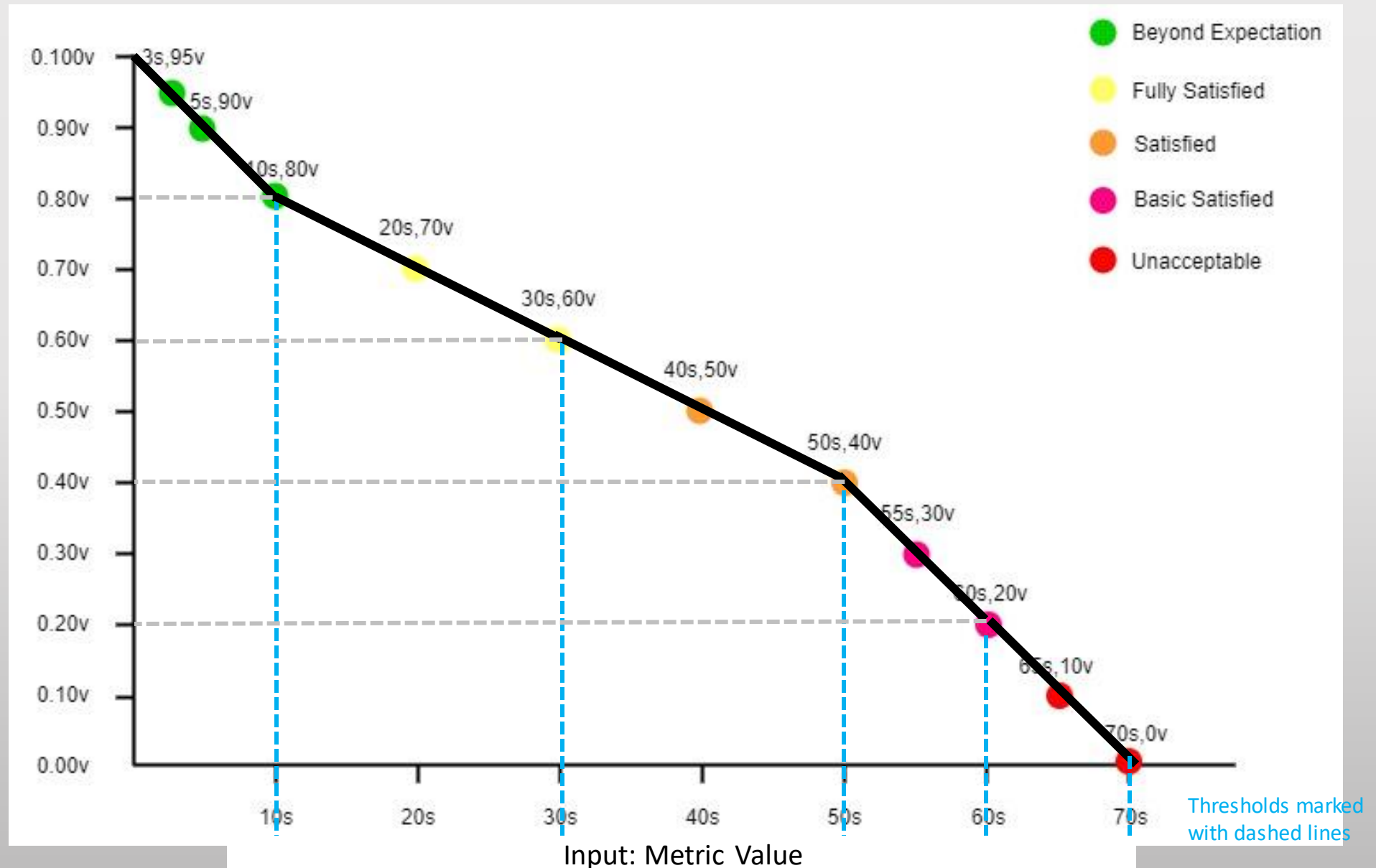
Metrics mentioned
by in the Excel table
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Literature

Metrics mentioned
by Developers and
in the Excel table

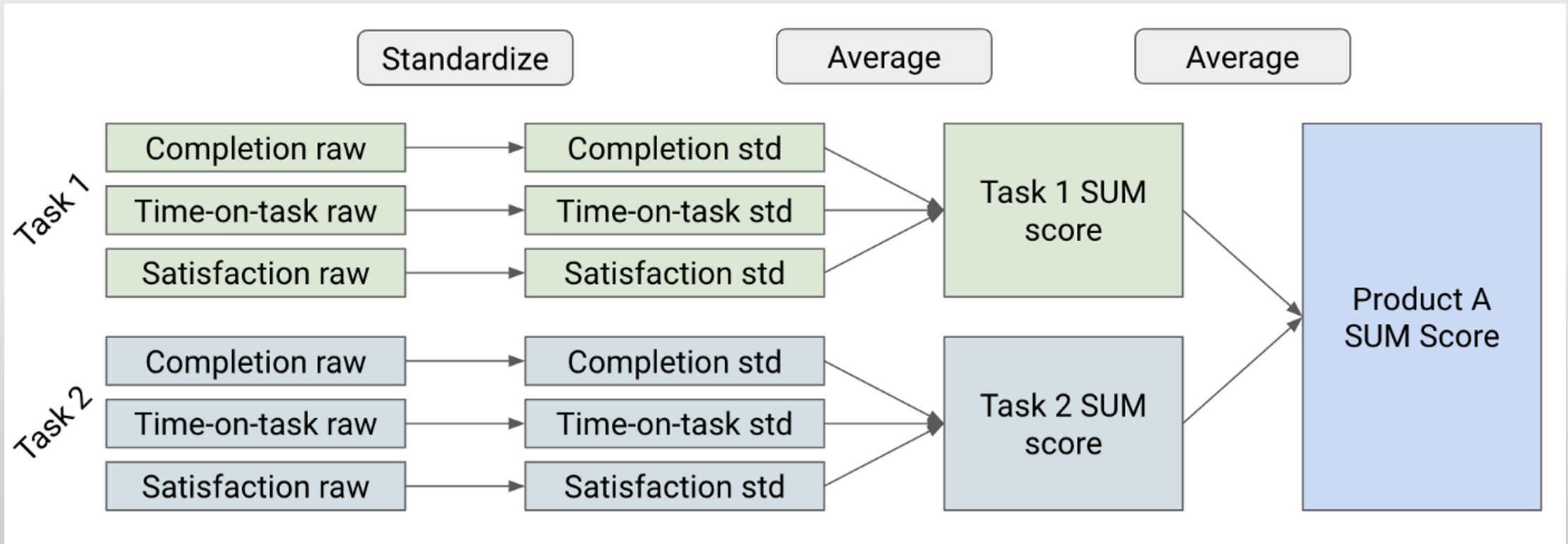


Conversion of Code Submission Duration

Output:
Value for
Dev-X



SUM (Single Usability Metric) Strategy



So far, several versions of SUM have been proposed

Sauro, Jeff, and Erika Kindlund. "A method to standardize usability metrics into a single score." In *Proceedings of the SIGCHI conference on Human factors in computing systems*, pp. 401-409. 2005.

Conclusion

- Human factors in Software Engineering are not limited to the Users only
- At least some part of developer productivity maybe controlled through improved developer experience
- Win and Win

1 **A Systematic Literature Review on Driving Developers Productivity Through**
2 **Enhanced Developer Experience: Factors, Practices, and Recommendations**

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4 ABDUL RAZZAQ, Lero, University of Limerick, Ireland

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6 JIM BUCKLEY, Lero, University of Limerick, Ireland

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8 QIN LAI, Huawei Technologies, China

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10 YUN TING TING, Huawei Technologies, China

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12 GOETZ BOTTERWECK, Lero, Trinity College Dublin, Ireland

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14 *Context and Motivation* — Developer eXperience (Dev-X) is a recent research area that focuses on developers perceptions, feelings, and values with respect to software development and software quality. Research suggests that factors and practices related to Dev-X

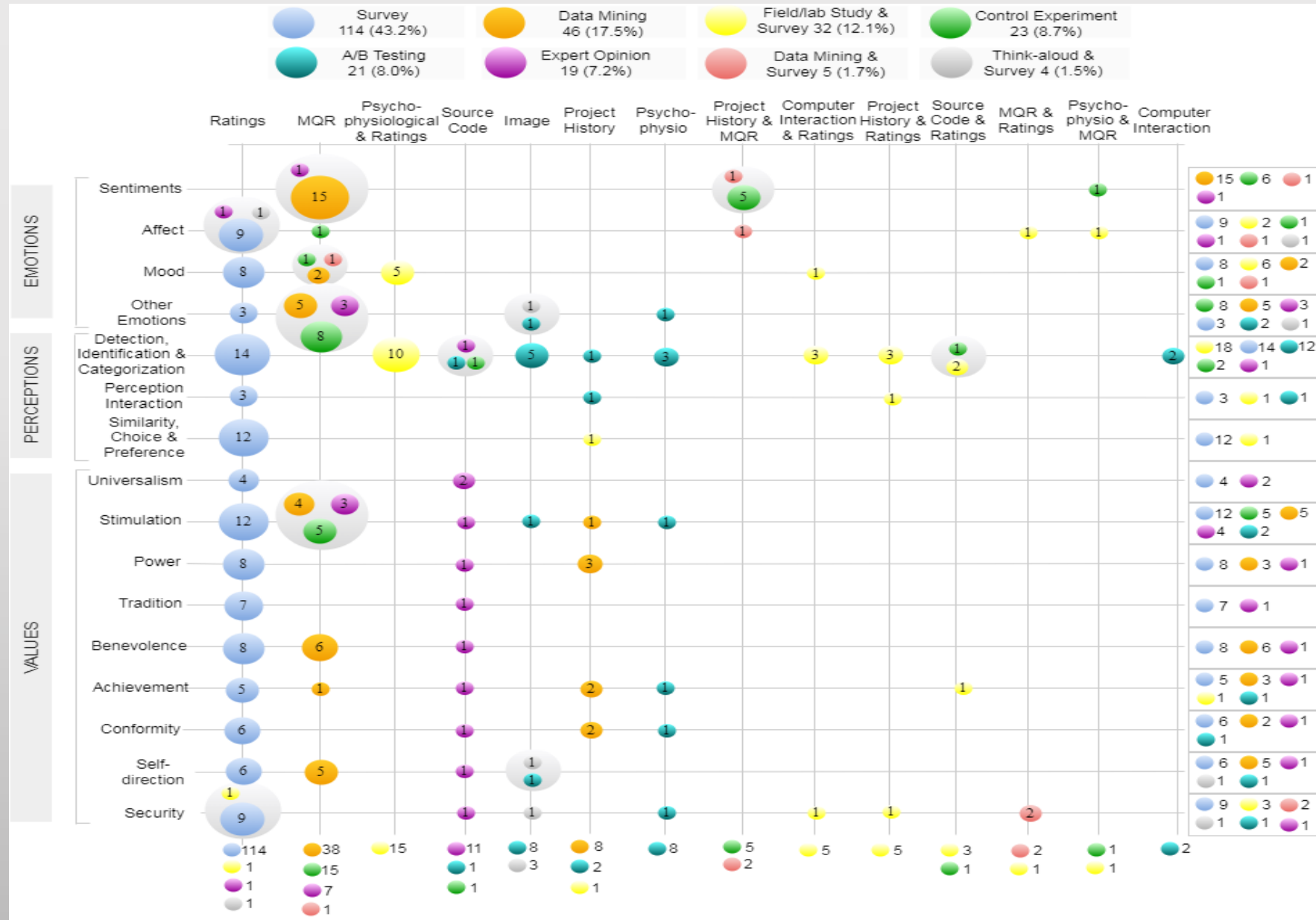
Looking for Collaboration

- Root Cause Analysis Frameworks
- Software Architecture Recovery
- Software Metrics
- Source Code Analysis
- Software Maintenance
- Bug/Feature Location

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Data Types Used in Measuring Dev-X



Evaluation Metrics to Assess Dev-X Factors

	Work Contexts	Interruptions	Team Culture	Code Complexity	Technical Support
Data Type	1) VCS repository data 2) Developer computer interaction data 3) Developer rating data 4) Task information	1) Routine related data 2) VCS repository data 3) Developer computer interaction data 4) Developer rating data	1) Organizational data 2) Process/standard related data 3) Emails/ mailing list data 4) VCS repository data 5) ITS repository data	1) Source code 2) VCS repository data 3) ITS repository data	1) Task related data 2) Developer related data 3) Emails/ mailing list data 4) VCS repository data
Metrics	1) Number of developers sharing an activity 2) Context-switches detected in traces 3) Developer perceived productivity rating 4) Number of external dependencies of task 5) Number of fragments in work	1) Number of Disturbances (e.g., meetings) 2) Developer response time 3) Interruptions detected in traces 4) Computer interaction metrics 5) Developer perceived flow rating 6) Developer perceived difficulty rating	1) CMMI level of organization 2) Following explicit strategies (yes/no) 3) High/low cohesion structure score 4) Related knowledge flow time 5) Socio-physiological compliance metrics 6) Developers' Congruence score	1) Code complexity metrics 2) Size-based metrics 3) Architectural complexity metrics 4) Scattering/ Sharing based metrics 5) Interface/ database complexity metrics	1) Number of questions accepted to answer 2) Task or relationship conflicts rating 3) Developers' facial expression types in communication 4) Number of Informal drawings (emojis) used in communications