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# Motivation of Workers on Microtask Crowdsourcing Platforms

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# Acronyms

ACBC	Adaptive Choice-Based Conjoint
ACR	Absolute Category Rating
AICC	Akaike's Information Criterion Corrected
API	Application Programming Interface
AVE	Average Variance Extracted
BIC	Bayesian Information Criterion
BPNT	Basic Psychological Needs Theory
BYO	Build Your Own
CA	Conjoint Analysis
CBC	Choice-Based Conjoint
CET	Cognitive Evaluation Theory
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit index
CI	Confidence Interval
COT	Causality Orientation Theory
CR	Composite Reliability
CWMS	Crowdwork Motivation Scale
EFA	Exploratory Factor Analyses
GDP	Gross Domestic Product
HB	Hierarchical Bayes
HIT	Human Intelligence Task
HTML	Hypertext Markup Language
IMI	Intrinsic Motivation Inventory
IR	Item Reliability
IS	Inconsistency Score
KMO	Kaiser-Meyer-Olkin
LOT	Listening Only Tests
MOS	Mean Opinion Score
MTurk	Amazon Mechanical Turk
MVP	Minimum Viable Product

MW	Microworkers
OCR	Optical Character Recognition
OIT	Organismic Integration Theory
QoE	Quality of Experience
RAI	Relative Autonomy
RMSD	Root Mean Square Deviations
RMSEA	Root Mean Square Error of Approximation
RSME	Rating Scale Mental Effort
RTLX	Row Task Load Index
SDT	Self-Determination Theory
SGML	Standard Generalized Markup Language
SOS	Standard deviation of Opinion Scores
SRQ	Self-Regulation Questionnaires
TLX	Task Load Index
TO	Turkopticon
WEIMS	Work Extrinsic Intrinsic Motivation Scale

# Abstract

Crowdsourcing microtask offers a fast, low-cost, and scalable approach to collect subjective data or solve problems that are still too complex for automatic processing and need human computation. Typical complex works can also be split up to some extent into simple tasks that can be performed through crowdsourcing microtasks. The range of possible microtasks is nearly countless, and potentially every computer-literate individual can be a crowdworker. Thus, studying the motivation of crowdworkers is crucial for the future of crowdsourcing microtasks to find out how to attract more people and reach a higher quality of outcomes.

In this book, first, a taxonomy for studying the motivation of crowdworkers is proposed including the potential influencing factors, different types of motivation, and possible consequences and outcomes related to the motivation. Next, the CWMS questionnaire, an instrument for measuring the underlying motivation of crowdworkers is developed. It considers different dimensions of motivation suggested by the self-determination theory of motivation which is a well-established and empirically validated psychological theory used in various domains. This instrument can be used to study the effect of platform and user characteristics on the general motivation of crowdworkers. Later, the task-specific motivation of crowdworkers is studied in detail: Influencing factors are investigated, subjective methods for measuring them are evaluated, a model for predicting worker's decision on taking a task is proposed, the relative importance of different factors for two populations of crowdworkers is studied, and finally, a model for predicting the expected workload (as one of the major influencing factors) given the task design is proposed. Last but not least, the effect of worker motivation and task design on the performance of crowdworkers is analyzed.

Results show that workers decide to take a task mostly based on its payout, expected workload, and interestingness, and in some cases how recently it was published and how many instances are available. Fairness and generosity of employers are also important for them. Their general motivation of crowdworking insignificantly influences the degree of importance of those factors. Users' characteristics such as skills, experiences, and preferences influence the perceived task's interestingness and estimation of workload. Workers with intrinsic or internalized

extrinsic motivation participate more and present more reliable answers when working on specific tasks. However, the degree of external and identified motivation relates to a worker's overall (long-term) reliability score. As this score is widely used by employers to select workers who can perform their job, serious workers, despite their underlying motivation, try to keep it high. Furthermore, applying reliability check methods, and acknowledging workers' reliable answers through the task design are recommended as results show that they encourage workers to provide high-quality answers.

# Zusammenfassung

Crowdsourcing Micro-Task bietet einen schnellen, kostengünstigen und skalierbaren Ansatz um subjektive Daten zu sammeln oder Probleme zu lösen, die immernoch zu komplex für eine automatische Verarbeitung sind und daher nach einer Bearbeitung durch Menschen verlangen. Typische komplexe Arbeitspakete können zu einem gewissen Maße in einfachere Aufgaben aufgeteilt werden, die mittels Crowdsourcing Micro-Tasks bearbeitet werden können. Die Einsatzmöglichkeiten von Micro-Tasks sind fast zahllos und potenziell kann jede Person, die sich mit Computern auskennt, ein Crowdarbeiter sein. Daher ist es für die Zukunft von Crowdsourcing Micro-Task entscheidend, die Motivation von Crowdworkern zu untersuchen, um mehr Personen anzusprechen und eine höhere Antwortqualität zu erzielen.

In dieser Dissertation wird zuerst eine Taxonomie zum Studium der Motivation von Crowdarbeitern vorgestellt, die potenzielle Einflussfaktoren, verschiedene Motivationstypen und mögliche Konsequenzen und Resultate bezogen auf die Motivation beinhaltet. Danach wird der CWMS-Fragebogen, ein Instrument zum Messen der zugrundeliegenden Motivation von Crowdarbeitern, entwickelt. Es betrachtet verschiedene Dimensionen der Motivation, die durch die Selbstbestimmungstheorie der Motivation, die eine gut etablierte und empirisch validierte psychologische Theorie ist und in verschiedenen Bereichen verwendet wird, vorgeschlagen werden. Dieses Instrument kann verwendet werden, um die Wirkung von Plattform- und Benutzereigenschaften auf die allgemeine Motivation der Crowdarbeiter zu untersuchen. Dann wird die aufgabenbezogene Motivation von Crowdarbeitern im Detail betrachtet: Einflussfaktoren werden untersucht, subjektive Methoden zu ihrer Messung werden ausgewertet, ein Modell zur Vorhersage der Entscheidung der Arbeiter für eine bestimmte Aufgabe wird vorgeschlagen, der relative Einfluss verschiedener Faktoren für zwei Populationen von Crowdarbeitern wird untersucht und schließlich wird ein Modell für die Vorhersage der erwarteten Arbeitsbelastung (als einer der wichtigsten Einflussfaktoren) verbunden mit dem Aufgabendesign vorgeschlagen. Nicht zuletzt wird die Wirkung von der Arbeiter-Motivation und dem Task-Design auf die Leistung von Crowdarbeitern analysiert.

Die Ergebnisse zeigen, dass die Entscheidung der Arbeiter eine Aufgabe zu bearbeiten, hauptsächlich auf der Auszahlungshöhe, der erwarteten Arbeitsbelastung und darauf beruht, ob die Aufgabe als interessant wahrgenommen wird und in einigen Fällen, vor wie langer Zeit sie veröffentlicht wurde und wie viele Aufgaben verfügbar sind. Fairness und Großzügigkeit der Arbeitgeber sind hierbei für die Motivation der Arbeiter auch wichtig. Ihre allgemeine Motivation für Crowdfunding beeinflusst die Bedeutung dieser Faktoren nicht signifikant. Die Eigenschaften der Crowdarbeiter, wie ihre Fähigkeiten, Erfahrungen und Präferenzen, beeinflussen die wahrgenommene Interessantheit von Aufgaben und die Einschätzung der Arbeitsbelastung. Arbeiter mit intrinsischer oder internalisierter extrinsischer Motivation beteiligen sich stärker und liefern zuverlässigere Antworten bei der Arbeit an bestimmten Aufgaben. Jedoch hängt der Grad der externen und identifizierten Motivation mit der Gesamtbewertung für die (Langzeit-)Zuverlässigkeit ("Reliability") eines Arbeiters zusammen. Da diese Bewertung von den Arbeitgebern verwendet wird, um Arbeiter auszuwählen, die ihre Aufgaben bearbeiten können, versuchen ihn ernsthafte Crowdarbeiter ungeachtet ihrer zugrundeliegenden Motivation hoch zu halten.

Darüber hinaus wird die Anwendung von Methoden der Zuverlässigkeitsprüfung und die Bestätigung von validen Antworten der Arbeitnehmer durch die Aufgabengestaltung empfohlen, da die Ergebnisse zeigen, dass diese die Crowdarbeiter dazu ermutigen, qualitativ hochwertige Antworten zu geben.