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# Cognitive Factors that Influence Workers' Task Performance in Crowdsourcing Microtasks

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**Abstract**

Cognitive factors play a crucial role in human computation and crowd-powered systems. However, the impact of cognitive factors in microtask crowdsourcing marketplaces has been studied to a limited extent. In this paper, we reflect on the importance of considering cognitive effects of task design and decomposition on crowd workers.

**Cognitive Considerations in Microtask Design**

Prior works have shown that task representation (visual saliency and corresponding working memory) has an impact on the quality of the results produced in crowdsourced microtasks [5, 3].

The cognitive system finds it difficult to process information once the short term memory capacity is reached [4]. In absolute identification tasks [4], it was found that the short term memory capacity is approximately 2.5 bits, which is equivalent to six alternative decisions at one time. Once this limit is reached perfect transmission from processing to memory encoding to response cannot be reached, and there will likely be a greater number of errors in task response. Thus, shorter tasks have the advantage of not presenting too much information in a single period of time.

Using the same theory of limits in information transmission and capacity, more recent studies (e.g., [7]) have demonstrated that task results involving decision-making

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*CHI'16*, May 7–May 12, 2016, San Jose, California, USA.  
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which uses short term memory, can be determined by the strict presentation order of the stimuli. Breaking a larger task which has some sequence presentation of items into smaller microtasks, can lead to different results.

Where applicable, requesters should consider the *bow effect* [1, 2, 6] during task decomposition. This effect stipulates that given a sequence of items presented, an individual will tend to remember the first item (the primacy effect) and the last (the recency effect), which can impact the type of decisions made in a task, ultimately effecting the results. Decomposing larger tasks into atomic units can shift the position of the primacy and recency effects, which could give greater saliency to those items (similar to a priming effect), and thus present a confound.

Cognitive components such as memory capacity, attention, motivation, and individual differences such as locus of control and self-efficacy should be considered during task design and decomposition. Only through identifying the impact of short term memory and other components of cognition, through the change in task length, can a better understanding of how these will potentially impact the study results, be made.

### Authors' Biography

**Darren J. Edwards**, has three degrees in psychology (B.Sc. M.Sc. Ph.D) and is a research psychologist working for an inter-professional department, at Swansea University (lecturer). He has published 20 peer-reviewed papers in high impact psychology journals and conference proceedings. He recently published a psychology book titled: "Integrating behavioural and cognitive psychology: A modern categorization theoretical approach." Darren's work covers sequence learning, the limitations in working (short-term) memory, and how individuals use categories to minimise

information loss in memory.

**Ujwal Gadiraju** is a PhD candidate at L3S Research Center, Leibniz Universität Hannover with main interests in *crowdsourcing*. He has published peer-reviewed papers in top-tier conferences in the realms of *Information Retrieval*, *Social Computing*, *Web Mining* and *Crowdsourcing*.

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