‘Making such bargain’: *Transcribe Bentham* and the quality and cost-effectiveness of crowdsourced transcription[1]

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Abstract

In recent years, important research on crowdsourcing in the cultural heritage sector has been published, dealing with topics such as the quantity of contributions made by volunteers, the motivations of those who participate in such projects, the design and establishment of crowdsourcing initiatives, and their public engagement value. This article addresses a gap in the literature, and seeks to answer two key questions in relation to crowdsourced transcription: (1) whether volunteers’ contributions are of a high enough standard for creating a publicly accessible database, and for use in scholarly research; and (2) if crowdsourced transcription makes economic sense, and if the investment in launching and running such a project can ever pay off. In doing so, this article takes the award-winning crowdsourced transcription initiative, *Transcribe Bentham*, which began in 2010, as its case study. It examines a large data set, namely, 4,364 checked and approved transcripts submitted by volunteers between 1 October 2012 and 27 June 2014. These data include metrics such as the time taken to check and approve each transcript, and the number of alterations made to the transcript by *Transcribe Bentham* staff. These data are then used to evaluate the long-term cost-effectiveness of the initiative, and its potential impact upon the ongoing production of *The Collected Works of Jeremy Bentham* at UCL. Finally, the article proposes more general points about successfully planning humanities crowdsourcing projects, and provides a framework in which both the quality of their outputs and the efficiencies of their cost structures can be evaluated.

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1 Introduction and Context

Research and cultural heritage institutions have, in recent years, given increasing consideration to crowdsourcing to improve access to, and the quality of, their digital resources. Such crowdsourcing tasks take many forms, ranging from tagging, identifying, text-correcting, annotating, and transcribing information, often creating new data in the process. Those considering launching their own cultural heritage crowdsourcing initiative are now able to draw upon a rich body of evaluative research, dealing with the quantity of contributions made by volunteers, the motivations of those who participate in such projects, the establishment and design of crowdsourcing initiatives, and the public engagement value of so doing (Haythornthwaite, 2009; Holley, 2009; Romeo and Blaser, 2011; Dunn and Hedges, 2012; Causer and Wallace, 2012). Scholars have also sought to posit general models for successful crowdsourcing for cultural heritage, and attempts have also made to assess the quality of data produced through such initiatives (Dunn and Hedges, 2013; Noordegraaf *et al.*, 2014; Causer and Terras, 2014b; Nottamkandath *et al.*, 2014; McKinley, 2015). All of these studies are enormously important in understanding how to launch and run a successful humanities crowdsourcing programme. However, there is a shortage of detailed evaluations of whether humanities crowdsourcing—specifically crowdsourced transcription—produces data of a high enough standard to be used in scholarly work, and whether it is an economically viable and sustainable endeavour. Focusing upon the economics of humanities, crowdsourcing may appear somewhat crass amidst discussions of its public engagement value, and of the opening up of research and resources to the wider community, but it is vital to have some idea of the economics of humanities crowdsourcing if cultural heritage institutions and research funding bodies—ever governed by budgets and bottom lines—are to be persuaded to support such (potentially) valuable initiatives.

This article takes the award-winning crowdsourced transcription initiative, *Transcribe Bentham*, as its case study. We have, in a prior discussion about *Transcribe Bentham*, made some tentative findings in this regard, based upon data from 1,305 transcripts produced by volunteers between 1 October 2012 and 19 July 2013 (Causer and Terras, 2014b). The present article expands upon, and moves beyond, these exploratory findings by introducing data from a further 3,059 transcripts, which were submitted between 20 July 2013 and 27 June 2014, all of which were produced by volunteers using an improved version of the *Transcribe Bentham* interface, the 'Transcription Desk'. The additional data allow us to make conclusions about the impact of this improved interface, about which we could only earlier speculate. That these 4,364 transcripts were gathered over a period of 20 months, also allows us to identify long-term trends about the rate of volunteer participation and the quality of submissions.

By examining these 4,364 transcripts, we seek to address some of the most fundamental questions about crowdsourcing in the humanities. Are volunteers' contributions of the required standard for public display and searching, and to form the basis of scholarly research? Would it not be more advisable to divert the resources assigned to designing, producing, and evaluating a crowdsourcing platform, and recruiting and managing volunteers, and checking their contributions, into employing experts to do the job? Does crowdsourcing make economic sense, that is, can large numbers of transcripts be produced on an economical basis, and will the investment made in doing it ultimately ever pay off?

The remainder of this first section will provide an overview of previous studies in the economics of crowdsourcing, before briefly introducing *Transcribe Bentham* and its purpose. Section 2 will examine the volume of work carried out by volunteer transcribers, and account for fluctuations in transcription rates during the period under examination (and beyond). Using the transcript data set, Section 3 will assess the quality of work submitted by volunteers, and Section 4 will examine the efficiency of *Transcribe Bentham*'s quality control process, the economics of the project, and how *Transcribe Bentham*—and, by extension, crowdsourced transcription more generally—could offer significant cost-avoidance potential in the

long-term. As a result, this article contributes to our understanding of the benefits of humanities crowdsourcing by providing a robust and detailed analysis of the economic models upon which it operates.

1.1 Previous work

Outside the realm of humanities crowdsourcing, there are extensive discussions of the economics of crowdsourcing focusing in the main on examining online marketplaces such as the Amazon *Mechanical Turk* platform, where users are asked to carry out atomized tasks in return for some small monetary reward.[2] Topics considered include how remuneration rates affect recruitment in paid crowdsourcing (Horton and Chilton, 2010), the *Mechanical Turk* marketplace as a space for 'experimental economists and researchers conducting natural field experiments' (Chandler and Kapelner, 2013), and the establishment of models for understanding worker motivations (Kaufmann *et al*, 2011). The ethics of paid crowdsourcing have come under scrutiny, with *Mechanical Turk* offering 'an average of $2/h with no benefits or worker protections' (Kittur *et al*, 2013), while the use of *Mechanical Turk* in generating academic research data has also been questioned (Matsakis, 2016). Meanwhile, the 'Turkopticon' internet browser extension seeks to help 'the people in the ''crowd'' of crowdsourcing watch out for each other—because nobody else seems to', and to 'avoid shady employers' by allowing them to rate each Amazon Turk task provider on several criteria including 'communicativity', 'generosity', and 'fairness'.[3]

Discussions of paid crowdsourcing, while interesting, are not directly relevant or applicable to voluntary crowdsourcing in the cultural heritage and humanities context. The tasks asked of, for example, the typical *Mechanical Turk* user, such as transcribing up to 35 s of audio, or categorizing several images for a total return of US$0.05, appear to carry little in the way of inherent enjoyment.[4] While those working in the *Mechanical Turk* marketplace might be assumed to be motivated primarily by remuneration, volunteers in humanities crowdsourcing projects consistently report that a key factor in their participation, aside from the intrinsic enjoyment of the task at hand, is the opportunity to contribute to something which will be of enduring benefit to others (Causer and Wallace, 2012; Dunn and Hedges, 2012). As Lascarides and Vershbow note in relation to the New York Public Library's *What's on the Menu?* project, cultural heritage crowdsourcing 'is about contribution, not consumption. It is less persuasion, more a call to action' (Lascarides and Vershbow, 2014). Humanities and cultural heritage crowdsourcing, then, is typically reliant upon voluntary labour and places no pressure—or should place no pressure—upon participants to contribute; participation, and how to participate, is entirely at the discretion of the user. As such, initiatives such as *Transcribe Bentham* can tap into a well-spring of motivated altruism in a way that a corporation or a *Mechanical Turk* task provider simply cannot (Nov, 2007; Yang and Lai, 2010; Causer and Wallace, 2012; Ridge, 2014). Therefore, when we discuss the economics of cultural heritage and humanities crowdsourcing in what follows, this should be understood as the sustainability and cost-effectiveness of the volunteer-fuelled endeavour.

1.2 *Transcribe Bentham*

Since launching to the public in September 2010, *Transcribe Bentham* has recruited volunteers from around the world to help UCL's Bentham Project[5] transcribe the enormous manuscript archive of the philosopher and reformer, Jeremy Bentham (1748–1832). While there are now a great number of humanities crowdsourcing initiatives, *Transcribe Bentham* is among the most demanding of its contributors (Terras, 2015; Terras, 2016). Volunteers are asked to carry out two interconnected tasks, each of which is daunting enough itself: first, the transcription of eighteenth- and nineteenth-century handwritten manuscripts; and second, the encoding of these transcripts in Text Encoding Initiative-compliant XML.[6] Despite the inherent challenge of both tasks for participants who typically have no prior experience of either, *Transcribe Bentham*'s volunteers have successfully transcribed and encoded over 19,000 manuscript pages, many of which are complicated to varying extents by deletions, interlineations, marginalia, and other compositional

features, as well as Bentham's frequently awful handwriting.

Transcripts produced by *Transcribe Bentham* volunteers feed into scholarly work in two interconnected ways. In the first instance, transcripts checked and approved—after meeting certain quality control standards—by *Transcribe Bentham* staff are uploaded to UCL Library's free-to-access digital repository alongside the respective manuscript images, to facilitate public searching and access.[7] Second, volunteer transcribers contribute to the production of the new, critical edition of the *Collected Works of Jeremy Bentham*.[8] The edition is based upon both Bentham's published works and unpublished manuscripts held by UCL Library's Special Collections (c. 60,000 folios, or c. 85,000 manuscript pages) and the British Library (c. 12,500 folios, or c. 15,000 manuscript pages), and will supersede the inadequate and incomplete eleven-volume edition of Bentham's works published between 1838 and 1843 (Schofield, 2009; Causer and Terras, 2014b). It is anticipated that the *Collected Works* will run to approximately eighty volumes.

Transcripts produced by volunteers are being, and will be, used as a starting point by researchers editing volumes of the *Collected Works*, and transcribers will be fully credited in any volume to which they contribute. Since the majority of the Bentham Papers are untranscribed, there is the scope to make exciting new discoveries about Bentham's life and thought. Volunteers have transcribed to completion Box 150 of UCL's Bentham Papers—which are arranged into 174 archival boxes—which contains Bentham's work in drafting the Thames River Police Bill of 1798.[9] Among these manuscripts, one transcriber identified a startling passage, in which the admittedly conservative Bentham of the 1790s, alarmed by the Terror in Revolutionary France, praised the British government's illiberal Treason Act of 1795 as 'a second Magna Charta' (Quinn, 2015).[10] In addition, volunteer transcripts are now also being used in the editing of Bentham's writings on the history of Australia, convict transportation, and colonialism (Causer, 2016).

Transcribe Bentham was initially supported by a 12-month Arts and Humanities Research Council (AHRC) grant. This funding supported the development, by the University of London Computer Centre, of the MediaWiki-based Transcription Desk crowdsourcing platform, the digitization of around 15,000 manuscript pages, and the salaries of two full-time research associates to co-ordinate and evaluate the initiative. The AHRC grant expired at the end of April 2011 and, from then until 30 September 2012, *Transcribe Bentham* was supported by some small-scale, internal UCL funding (Causer and Terras, 2014b).

The initiative subsequently secured a 2-year grant from the Andrew W. Mellon Foundation's 'Scholarly Communications' programme, which ran from 1 October 2012 to 30 September 2014. This grant was, in large part, to evaluate the efficiency of crowdsourced transcription, and will ultimately have supported the digitization of almost all the remainder of the UCL Bentham Papers, along with an estimated 15,000[11] manuscript pages of the British Library's Bentham Papers. Support from the Mellon Foundation also allowed the University of London Computer Centre to make improvements to the Transcription Desk, which were designed to make participation more straightforward for volunteers. The key changes included the introduction of an image viewer allowing the rotation of the manuscript image, 'maximise' and 'minimise' buttons to let the user take advantage of as much screen space as possible, and the introduction of a tabbed user interface (Causer and Terras, 2014b). The tabbed interface allows volunteers to instantly switch between their transcript and a live preview of how it will look when saved, showing how the TEI-encoded parts of the text are rendered and displayed. Before the fuller data on which this article is based was available, we speculated that the second iteration of the Transcription Desk, launched on 15 July 2013, would assist volunteers in more easily understanding how the TEI mark-up works, and thereby reduce the number of inconsistencies or encoding errors made by volunteers, and in turn make the process of checking submitted transcripts more efficient (Causer and Terras, 2014b). With the additional data gathered for this article, we are now able to test this thesis, and will discuss the impact of the second iteration of the Transcription Desk in Sections 3 and 4.

Table 1. Quantity of words transcribed by volunteers, 1 October 2012 to 27 June 2014, excluding and including TEI mark-up

Period	Total words transcribed by volunteers, excluding mark-up	Total words transcribed by volunteers, including mark-up	Average number of words per transcript, excluding mark-up	Average number of words per transcript, including mark-up
1 October 2012 to 27 June 2014 (Overall)	1,180,829	1,618,973	271	371
1 October 2012 to 14 July 2013 (Period A)	418,344	586,789	325	456
15 July 2013 to 27 June 2014 (Period B)	762,485	1,032,184	248	336

Table 2. Comparison of transcription rates (overall) since *Transcribe Bentham* launched, (1) prior to funding from the Mellon Foundation, and (2) during the period supported by the Mellon Foundation

Period	Manuscripts transcribed/ partially transcribed	Average weekly rate (Yearly rate)
(Overall) 8 September 2010 to 30 September 2014	10,986	52 (2,704)
(1) 8 September 2010 to 30 September 2012	4,412	41 (2,132)
(2) 1 October 2012 to 30 September 2014	6,574	64 (3,328)

2. Quantity of Work

By any measure, *Transcribe Bentham* volunteers have contributed a colossal amount of work over the lifetime of the project. At the time of writing—20 November 2017—19,287 manuscripts had been transcribed or partially transcribed by volunteers.[12] Between 1 October 2012 and 27 June 2014 alone, they transcribed over 1.6 million words, including TEI mark-up (Table 1). Such was the rate of volunteer participation during the final 6 months of the Mellon Foundation-funded period (Period B in Table 1), that it is now conceivable that the entirety of the Bentham Papers could be fully transcribed in the relatively near future (see Section 4.2).

During the 2 years funded by the Mellon Foundation, the tremendous progress made by volunteers can be best illustrated by a comparison of transcription rates. As shown in Table 2, overall, an average of 52 manuscripts were transcribed or partially transcribed each week from 8 September 2010 to 30 September 2014. The Mellon Foundation-funded Period 2, in comparison, saw an average of 64 manuscripts transcribed or partially transcribed each week.

Though the transcription rate for Period 2 was somewhat greater than during Period 1, it does not appear, at first glance at least, significantly greater than the overall transcription rate. However, splitting the 24 months funded by the Mellon Foundation into two parts, Periods A and B, indicating when volunteers respectively used the first and second iterations of the Transcription Desk, reveals a dramatic disparity in the transcription rate (Table 3 and Fig. 1). During Period A, volunteers transcribed or partially transcribed an average of 34 manuscripts each week, while during Period B, this rose to an average of 81 per week. How, then, might we account for this great increase in participation?

The introduction of the second iteration of the Transcription Desk at the start of Period B did lead, as we had hoped (Causer and Terras, 2014b), to a slightly increased level of participation, though the effect proved short-lived. The real driving force behind the increased rate of participation was instead making available, on 15 March 2014, the first batch of the British Library's Bentham manuscripts. From then, *Transcribe Bentham* experienced an extraordinarily high and sustained level of participation, the likes of which it had never seen

Table 3. Comparison of transcription rates under Mellon Foundation funding, divided into two periods, in which volunteers used (A) the first iteration of the Transcription Desk, and (B) the improved, second iteration

Period	Manuscripts transcribed/ partially transcribed	Average weekly rate (yearly rate)
(A) 1 October 2012 to 14 July 2013	1,372	34 (1,768)
(B) 15 July 2013 to 30 September 2014	5,202	81 (4,212)

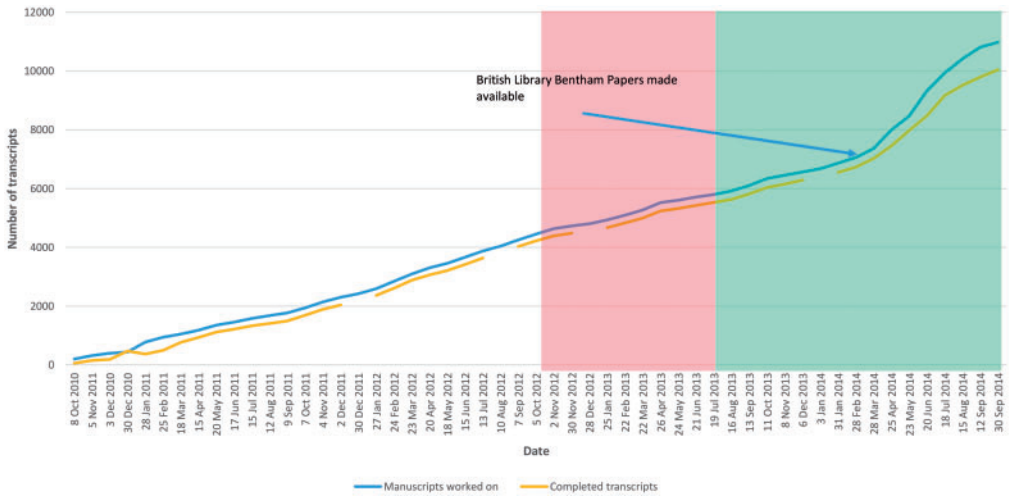

Fig. 1. *Transcribe Bentham* progress, 8 October 2010 to 30 September 2014, showing the number of manuscripts transcribed or partially transcribed, and the total number of transcripts which have been checked and approved by *Transcribe Bentham* staff.[44]

before, even greater than was evidenced in the wake of a *New York Times* article about the project in late December 2010 (Cohen, 2010; Causer *et al.*, 2012). From 15 March 2014 to 30 September 2014, an average of 129 manuscript pages were transcribed or partially transcribed each week, far exceeding our hopes that an 'upgraded Transcription Desk and ongoing publicity campaign' might 'recruit enough volunteers to produce between 75 and 100 transcripts per week' (Causer and Terras, 2014b) (Fig. 1).

But why would the British Library's Bentham Papers be such an attraction? Around 60% of these manuscripts consist of letters not only to and from Jeremy Bentham himself, but his friends and family, including his father Jeremiah,[13] his mother Alicia,[14] his younger brother Samuel,[15] his sister-in-law Maria Sophia,[16] and his nephew, the famous botanist George Bentham.[17] The letters of Samuel Bentham, the notable engineer and naval architect, who spent a decade from 1780 travelling widely in Russia in the service of Catherine the Great and Prince Potemkin, are a tremendous historical resource in and of themselves (Christie, 1993; Morriss, 2015). Samuel devised the 'central inspection principle', in his case to supervise a workforce, which his elder brother later adapted for his panopticon prison scheme. Moreover, the correspondence demonstrates the sheer breadth of Jeremy Bentham's connections and his personal, intellectual, and political interests, with correspondents ranging from prime ministers to his tenants, and people as varied as the English abolitionist William Wilberforce, Tsar Alexander I of Russia, the biographer Harriet Grote, and the Guatemalan

politician and philosopher José del Valle. In short, the letters drew in new users and acted as a 'gateway' to further participation. Correspondence manuscripts are often shorter, of more straightforward layout, and are more legible than many of the philosophical documents typically found within the UCL Bentham Papers. Perhaps most importantly, the letters are of human interest and they are, usually, self-contained documents, with a beginning and an end, in a way that the typical UCL manuscript is not.[18]

The correspondence saw the recruitment of a number of new volunteers who went on to become 'Super Transcribers' (that is, someone who contributes or has contributed significant numbers of transcripts on a regular basis), who were drawn in by the correspondence before moving on to the philosophical material when more confident. The introduction of the letters also stimulated *Transcribe Bentham*'s existing Super Transcribers to increase their rate of participation. Instrumental to this recruitment and encouragement were two entries posted on the British Library's *Untold Lives* blog, which receives an average of around 16,500 visits per month. The first post acted as an introduction, offering volunteers the opportunity to 'uncover Bentham's more personal side' (Grint and Causer, 2014a). In response, two volunteers, who went on to become Super Transcribers, wrote of their experience of transcribing letters describing Bentham's childhood (Jonker and van der Zwaag, 2014),[19] including one letter in which Jeremiah Bentham described, to his absent wife, how the infant Jeremy 'kiss'd' a note 'from his dear Mama'.[20]

The second post on *Untold Lives* provided a few examples which volunteers had transcribed (Grint and Causer, 2014b), including a rather intense love letter from Jeremiah Bentham to his future wife, Alicia Whitehorne, in which he described how when they were apart 'so slowly do the Sluggish Minutes now creep forward—such is the Difference caus'd by mighty Love!'.[21] By comparison, a quarter-page advertisement placed in the December issue of *History Today* magazine for £350—on the basis that its readership is of a similar demographic and has a similar range of interests to our Super Transcribers—was much less successful than anticipated, as it recruited only one volunteer who went on to become a Super Transcriber.[22]

3. The Accuracy of Volunteer Transcription

It is more than evident, as we have discussed elsewhere (Causer and Terras, 2014b), and as will be demonstrated in detail in this section, that contributors to *Transcribe Bentham* take great care to ensure that their work is as accurate as possible before submitting it for checking. In our previous discussions of *Transcribe Bentham*, we have always highlighted the extremely high standard of volunteer transcription, though in making such conclusions we have relied upon our subjective experience of checking transcripts. We can, of course, point to the fact that 94% of all transcribed or partially transcribed manuscripts have been approved by *Transcribe Bentham* staff at the time of writing but now, thanks to the more extensive quantitative data gathered for this article, we can demonstrate just how reliable the products of crowdsourced transcription can be.

3.1 Methodology

The following findings are based upon the 4,364 checked and approved transcripts submitted between 1 October 2012 and 27 June 2014. Data were collected during the first 20 months of the Mellon Foundation-funded period, and analysed during the final four months of that period. The data were entered into an Excel spreadsheet and consist of the following metrics and variables:

- **The name of the volunteer who submitted the transcript and, if applicable, the names of those who had previously worked on it**.[23] The experience of volunteers is a key factor in accounting for the quality of both the text of the transcript and the TEI mark-up. Super Transcribers typically make fewer errors, and their transcripts generally take less time to check, than those of less experienced volunteers.
- **In whose hand the manuscript was written.** Most manuscripts in the Bentham Papers are in

Bentham's own hand, though a significant proportion were written by copyists, editors, and Bentham's correspondents. A manuscript written by Bentham is typically more difficult to transcribe and encode than a fair-copy sheet, as the former is more likely to contain complex compositional and structural features. Deciphering Bentham's handwriting can be a significant challenge, particularly as it deteriorated markedly later in his life.

- **The number of words in the transcript, excluding the TEI mark-up.** The amount of text to be transcribed is another factor in accounting for the number of transcription errors, as well as the time it can take to check a transcript. Lengthy manuscripts are likely to have been written by Bentham himself, and so more likely to contain complex compositional features.
- **The number of words in the transcript, including the TEI mark-up.** Adding TEI mark-up to a transcript is a far from a trivial task, particularly when dealing with complex features such as multiple or nested interlineations. Transcripts containing a greater amount of mark-up typically take longer to check, and are more likely to require alteration than those containing less mark-up.
- **The number of alterations and/or corrections made to the text of the transcript by *Transcribe Bentham* staff before it was approved.** If few or no alterations were made, then we can assume that the volunteer coped well with the transcription task, and less well if many alterations were required. A high number of alterations could suggest that the transcriber was inexperienced, that the manuscript was difficult to decipher, or that sections of the manuscript were not transcribed.
- **The number of alterations and/or corrections made to the TEI mark-up of the transcript by *Transcribe Bentham* staff before it was approved.** If few or no changes were required, then we can assume that the volunteer coped well with the encoding task. A high number of alterations could suggest that the volunteer coped less well, and/or that manuscript was of significant complexity and/or length.
- **The time spent checking a transcript and making alterations and/or corrections**. If a transcript was checked and approved quickly by *Transcribe Bentham* staff, we can assume that it was transcribed and encoded to a high standard and required few alterations, and/or that the manuscript may not have been a complex one. Transcripts which took a significant amount of time to check generally required a greater number of alterations to both text and, more particularly, the mark-up. This metric is vital for assessing and cost-effectiveness of the quality-control process.

When checking a transcript, the aim is to ensure that the text is accurate compared to the original manuscript, and that the TEI mark-up is valid, consistent, and well formed, with alterations and corrections made where considered necessary. In judging whether or not a transcript should be approved, we decide whether the transcript is suitable for public viewing and searching via UCL Library's digital repository, and whether the transcript will form a viable basis for future editorial work. The quality control process is, as we have suggested elsewhere, an 'unavoidably impressionistic and subjective judgement' on our part. Few transcripts will be absolutely perfect, but the checking process 'does ensure that locked transcripts are a reliable guide to the contents of the manuscripts' (Causer and Terras, 2014b).

By way of example, let us take the assessment of the transcript of JB/116/396/001.[24] First, the date on which the transcript was checked was entered into the spreadsheet, and it was recorded that the manuscript was written in Bentham's hand. The number of words were recorded, first including, then excluding, the TEI mark-up. JB/116/396/001 was thus comprised of 192 words including TEI mark-up (or 111 words excluding the TEI mark-up).

A digital timer was started to record how long it took to check the transcript. Three alterations were made to the text: in the first line of the transcript, the 'I' transcribed by the user was replaced with a 'Q',[25] the word 'respects' in the first line of the second paragraph was replaced with 'reports', and 'Brumbury' further down the same paragraph was replaced with 'Bunbury'.[26] The TEI mark-up required only two alterations: a set of unclear word tags (<unclear></unclear>) were removed

Table 4. Summary of the extent of alterations made to the text and TEI mark-up of 4,364 checked and approved transcripts, 1 October 2012 to 27 June 2014

Period	Total number of alterations to transcripts	Total number of alterations to text of transcripts	Total number of alterations to mark-up of transcripts	Average number of alterations to text of transcripts	Average number of alterations to mark-up of transcripts
(Overall) 1 October 2012 to 27 June 2014 (Overall)	34,335	13,279	21,056	3	5
(A) 1 October 2012 to 14 July 2013	15,656	5,260	10,396	4	8
(B) 15 July 2013 to 27 June 2014	18,679	8,019	10,660	3	4

from around 'S.P' in the first line as the transcriber's suggestion was correct, and the closing tag of the interlineation 'presents his compliments' ('</add>') had not been included, and was added. The timer was stopped, and the transcript saved, whereupon it was recorded that it had taken 195 s (3 min and 15 s) to check and approve it.[27] The transcript was then locked, and a notification message was left on the submitting volunteer's user page to inform them that the transcript had been approved.

In the following discussion, where we refer to an 'average', this is a mean average.

Table 4 provides an overview of the quality-control process. The key finding is that while the average number of alterations to the text required before approval only slightly improved in Period B compared to Period A, the average number of alterations needing to be made to the TEI mark-up halved. In the remainder of this section, we explain these differences, and the extent of staff intervention required when correcting transcripts.

3.2 Accuracy of the text of transcripts

Over the entire assessment period—1 October 2012 to 27 June 2014—only 1% (13,279) of the 1,180,829 words (excluding TEI mark-up) collectively transcribed by volunteers required any alteration by staff, and a transcript required only an average of three alterations to its text before being approved.[28] The quality of volunteer transcription was clearly extremely high (Fig. 2 and Table 5).

Overall, 46% (1,995) of transcripts were approved without requiring any changes to the text, a further 40% (1,765) required one to five changes each, and 6% (263) needed between six and nine alterations each. It was a minority of transcripts—8% (341)—which needed ten or more alterations to the text before approval. Such extensive alteration to the text was typically required in cases where the volunteer had been unable to read portions of the manuscript, or where they had missed a small section or a marginal note or notes which the checker subsequently added. For example, the bottom-right quadrant of JB/100/001/001 had not been transcribed when it was submitted, and was added by the checking member of staff.[29] This added a further 114 words to the text of the transcript, but the rest of the transcript had been transcribed to a very high standard.

The standard of transcription was already high during Period A, when transcripts required an average of four alterations to the text before being accepted, but it improved still further during Period B, when an average of three alterations were required before a transcript was approved. During Period A, 39% of transcripts (506) were approved without any alteration to the text, 41% (533) required one to five alterations each, and 11% (96) needed between six and nine changes. Only 12% (153) required ten or more alterations each before being accepted.

During Period B, a greater proportion of transcripts—48% (1,995)—were accepted without any alteration to the text. Forty percent (1,232) required one to five alterations each, 5% (167) needed between six and nine changes, and 6% (188) needed ten or more alterations before being accepted. This appreciable improvement in the already excellent standard of transcription can best be accounted for by the increased proficiency of Super Transcribers, but perhaps also because about a third of the transcripts worked on during Period B were correspondence sheets from the British Library. These are sometimes—but by no means consistently—easier to

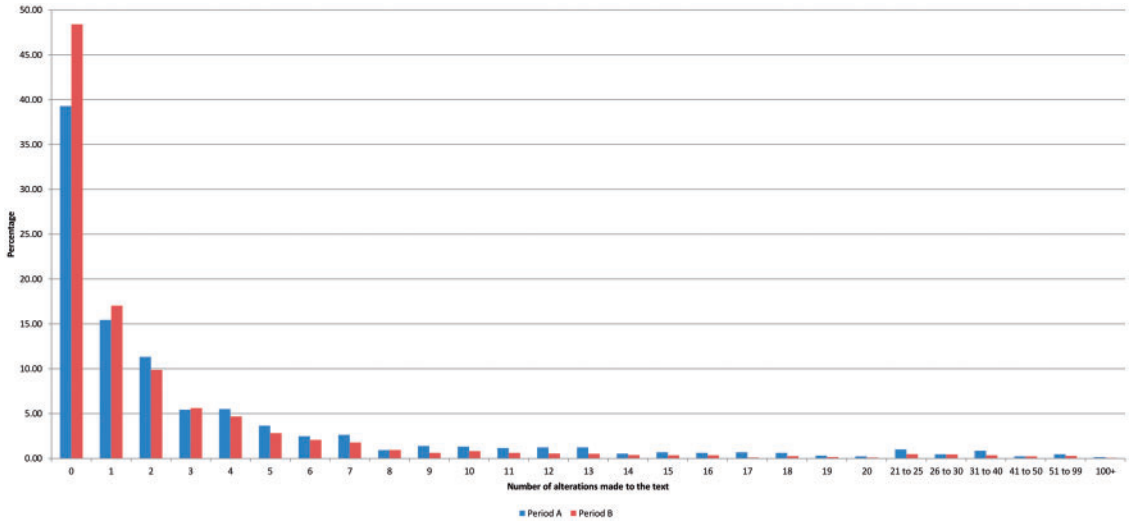

Fig. 2. Changes made to the text of transcripts during the quality control process during Period A (1 October 2012 to 14 July 2013) and Period B (15 July 2013 to 27 June 2014)[45]

Table 5. Comparison of the efficiency of the quality-control process for manuscripts, in the hands of Jeremy, Jeremiah, and Samuel Bentham, and fair-copy manuscripts[48]

Penner	Number of manuscripts	Average number of alterations to text	Average number of alterations to mark-up	Average time to check and approve transcript (seconds)
Jeremy Bentham	1,465	3	4	177
Samuel Bentham	235	1	1	127
Jeremiah Bentham	54	2	2	116
Fair-copy manuscripts	863	2	4	97

decipher than UCL Bentham manuscripts; sheets written by Samuel[30] and Jeremiah Bentham[31] can certainly both be challenging, and anything in the hand of the elderly Jeremiah can cause problems to the transcriber (Table 5).

3.3 Accuracy of the TEI mark-up

Though volunteers coped admirably well with adding TEI mark-up to their transcribed manuscripts, this task has nevertheless caused them more difficulty than transcription, and hence more in the way of work for *Transcribe Bentham* staff than was required to check the text of transcripts.

During Period A, 23% (299) of transcripts were approved without any alteration to the mark-up, 42% (536) required between one and five alterations, and 11% (146) needed between six and nine changes. Twenty-four percent (307) of Period A transcripts needed ten or more alterations each before they were approved, and a disproportionate, and unsustainable in the long-term, amount of staff time was spent checking them: it took 57 h, 39 min and 30 s to check and approve these 307 transcripts, or 45% of all the time spent checking transcripts during Period A. It was, then, by reducing the frequency of mark-up errors made by transcribers, rather than attempting to achieve slight improvement in the excellent standard of transcription, that we would see the greatest efficiency savings. As we had hoped it would before

the required data were available to test it (Causer and Terras, 2014b), the improved, second iteration of the Transcription Desk, in making it more straightforward to see the workings of the TEI mark-up, appears to have had the desired effect (Fig. 3).

The difference between Periods A and B is stark. During Period B, 35% (1,080) of transcripts were approved without the need for any alteration to the mark-up, a greater proportion than during Period A. Forty-seven percent (1,460) needed between one and five alterations, while 9% (274) of transcripts required between six and nine alterations each. Only 8% (261) of Period B transcripts needed ten or more alterations, and a much-reduced amount of staff time was spent checking these transcripts requiring more extensive alteration: it took 31 h and 7 min, or 26% of the total time spent checking transcripts during Period B, to work through and approve these 261 transcripts. That volunteers made fewer errors in applying TEI mark-up to their transcripts during Period B than Period A is attributable to their increased experience and proficiency at the encoding task, facilitated in large part by the second, improved iteration of the Transcription Desk.

4. The Economics of *Transcribe Bentham*

4.1 Efficiency of the quality-control process

As noted in Section 2, the major driver of increased participation was the availability of the British Library Bentham Papers. As Section 3 has demonstrated, it was the improvements made to the Transcription Desk which facilitated a reduction in the frequency of errors made by volunteers when encoding their transcripts, and this reduction was the key in increasing the efficiency of the quality-control process.

From 1 October 2012 to 27 June 2014, staff spent 890,274 s (247 h, 17 min and 54 s) checking and approving transcripts, with it taking an average of 207 s (3 min and 27 s) to check a transcript (Table 6).[32] To be fully illustrative, this overall figure needs to be broken down once more into the two periods representing the use of the two

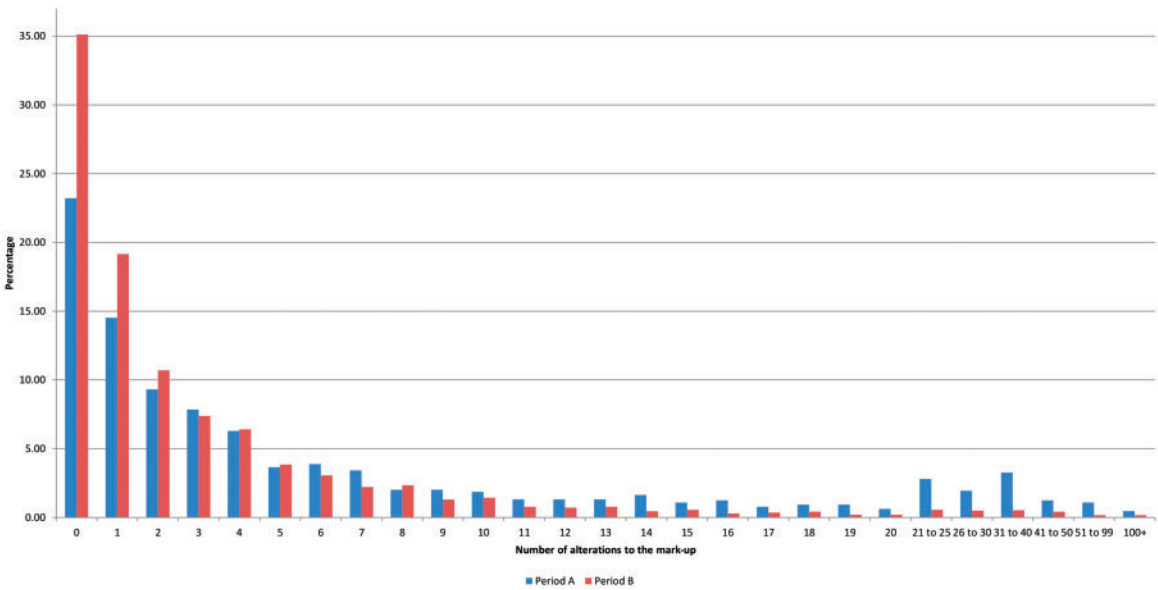

Fig. 3. Changes made to the mark-up of transcripts during the quality control process during Period A (1 October 2012 to 14 July 2013) and Period B (15 July 2013 to 27 June 2014)[46]

iterations of the Transcription Desk, so that the impact of the second iteration can be more clearly seen. In doing so, we can also move beyond our previous, tentative observations on the efficiency of the quality control process, in which we found that it took an average of around 6 min for a staff member to check and approve a transcript (Causer and Terras, 2014b) (Fig. 4).

It took an average of 364 s (6 min and 4 s) to check a transcript submitted during Period A, when volunteers used the first iteration of the Transcription Desk. Thirty-eight percent (482) of these 1,275 transcripts were checked at or below the overall average checking time of 207 s (3 min and 7 s). Though only 17% (213) of these transcripts took 600 s (10 min) or more to check, they took up a disproportionate amount of the overall checking time, most of which was spent amending the TEI mark-up. Of the 128 h, 53 min, and 12 s spent checking these 1,275 transcripts, 57 h, 26 min, and 12 s—or 45% of all the time spent checking transcripts during Period A—was spent dealing with these 213 transcripts. The amount of time spent upon checking these more complex transcripts was simply unsustainable, and had to be reduced, and it was in assisting volunteers to

Table 6. Staff time spent on the quality control process, 1 October 2012 to 27 June 2014[49]

Period	Total time spent on quality control, seconds (hours and minutes)	Number of transcripts checked and approved for which data is available	Average time spent checking a transcript, seconds
(**Overall**) 1 October 2012 to 27 June 2014	890,274 (247 h, 17 min, and 54 s)	4,364 (data for 4,309)	207 s
(**A**) 1 October 2012 to 14 July 2013	463,992 (128 h, 53 min, and 12 s)	1,288 (data for 1,275)	364 s
(**B**) 15 July 2013 to 27 June 2014	426,282 (118 h, 24 min, and 42 s)	3,076 (data for 3,034)	141 s

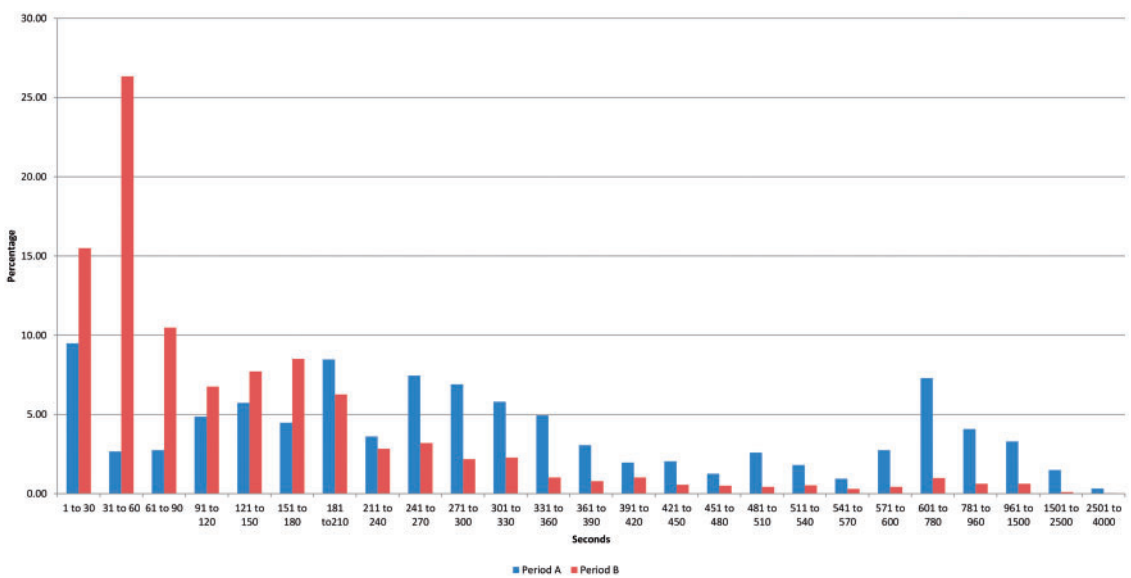

Fig. 4. Time (in seconds) spent checking and approving transcripts during Period A (1 October 2012 to 14 July 2013) and Period B (15 July 2013 to 27 June 2014)[47]

reduce the frequency of encoding errors which was the key to improving the efficiency of the quality control process.

Increased efficiency was indeed achieved during Period B, with our best estimates being far exceeded: Period B transcripts took an average of 141 s (2 min and 21 s) to check,[33] almost two-and-a-half times less than the average checking time during Period A.

During Period B, 81% (2,452) of the 3,034 transcripts for which data were available were checked and approved at or below the overall average checking time of 207 s per transcript, a far greater proportion than during Period A. But the key point is that during Period B, 2% (73) of approved transcripts required more than 10 min of attention. These 73 transcripts took a total of 19 h, 3 min, and 43 s to check, or 16% of the total time of 118 h, 24 min and 42 s spent checking transcripts during Period B.

Also requiring consideration in this discussion is that those checking the transcripts became more proficient at the task over time. Though care was taken to ensure that consistency was maintained throughout the period when the data were recorded, there is no accurate measurement to assess the efficiency of the individual moderators.

In summary, by the end of Period B, the *Transcribe Bentham* quality control process was more efficient than ever, and volunteer transcribers were producing work of a professionally high standard. The average checking time per transcript was greatly reduced, to the extent that almost two-and-a-half times as many transcripts were checked by staff during Period B than in Period A in a shorter overall time. This striking improvement had two major causes. First, and most importantly, was the increased user-friendliness of the second iteration of the Transcription Desk. This led to the increased proficiency, particularly in adding TEI mark-up to transcripts, of Super Transcribers, and a concomitant reduction in the time spent checking the average transcript. Second it is worth noting that transcripts submitted during Period A were, on average, around eighty words longer excluding mark-up, and 120 words longer including mark-up, than those submitted during Period B. Yet this difference in length cannot alone, as we have shown in this section, adequately account for the increased efficiency of the quality control process.

4.2 Cost avoidance

In Section 3 we established that one of the major concerns about crowdsourced transcription, namely, the quality of work produced by volunteers, need not be a worry (at least in the case of *Transcribe Bentham*). Using the data presented above, in this section, we will attempt to fill a gap in the literature by addressing the other major reservation about crowdsourced transcription, whether it is an economically viable and sustainable endeavour, by examining the economics of running a volunteer-supported crowdsourcing project. *Transcribe Bentham* does, as we will show, offer the potential for significant long-term cost avoidance.

Before beginning this discussion, any analysis must consider the £589,000 invested in *Transcribe Bentham* by the AHRC and the Andrew W. Mellon Foundation. About £192,000 of this money was spent on digitizing the Bentham Papers at UCL and the British Library, and about £80,000 on software development. The remainder was spent on storage, equipment, and academic salaries. So, while establishing and developing, *Transcribe Bentham* did not come cheaply, institutions wishing to crowdsource transcription of their own material can now take advantage of the freely accessible code for the Transcription Desk, a tried-and-tested platform for collaborative transcription.[34] Using the Transcription Desk—or one of the other freely available crowdsourced transcription platforms such as *Scripto or FromThePage*[35]—could allow institutions to significantly mitigate start-up costs, although the implementation and customization of any of these platforms would necessarily require some degree of investment. If an institution already had digital images of their collections to hand, then costs could be mitigated even further.

Transcribe Bentham's long-term sustainability and cost-effectiveness did not seem particularly apparent when, based upon our first 6 months of testing, we made some rather pessimistic preliminary observations. From 8 September 2010 to 8 March 2011, volunteers transcribed or partially transcribed 1,009 manuscripts, at an average rate of 168 per

month, or 35 per week. Had the two full-time research associates then employed on the project instead spent 6 months transcribing manuscripts on a full-time basis, they could reasonably have been expected to produce around 2,400 transcripts between them, working at more than twice the rate of the volunteer transcribers then participating. Based on this observation, we concluded that *Transcribe Bentham* did not seem 'particularly cost-effective, at least in the short-term'. We did, however, note that volunteers had carried out a great deal of work during those first 6 months and that there were future grounds for optimism: volunteers would become more proficient at transcription and encoding, staff would become more experienced and efficient in checking transcripts, and there was scope for the transcription rate to increase as more volunteers joined the project (Causer *et al.*, 2012). It must be noted, however, that these preliminary conclusions about the efficiency of *Transcribe Bentham* were impressionistic estimates, as we did not then collect anything approaching the detailed data which have been discussed in this article.

As noted in Sections 3.2, 3.3, and 4.1, *Transcribe Bentham* volunteers were, by 27 June 2014, producing extremely high-quality transcripts at a faster rate than ever before, while the quality-control process had never been more efficient. Yet this was only achieved after 4 years of developing and sustaining *Transcribe Bentham*, and similar, complex crowdsourcing programmes should be thought of as longer-term projects which can capitalize on gained expertise, on the part of both participants and project managers. This has obvious implications for planning and sustaining such projects, in a sector where budgets are limited.

It is sometimes suggested to the *Transcribe Bentham* team that the expense of running the project could be reduced by devolving the task of checking transcripts to experienced volunteers. We broached this topic in assessing *Transcribe Bentham*'s first 6 months, speculating that in the future, 'volunteer-moderators' might check submissions, which would then 'only require a brief checking over by editorial staff' before being approved (Causer *et al.*, 2012). We have, however, since discarded this idea. It is clear from conversations with Super Transcribers that they were not remotely attracted by the prospect of checking the submissions of fellow transcribers, nor of having their own transcripts checked by another volunteer. Transcribers overwhelmingly prefer instead to continue to transcribe with support from *Transcribe Bentham* staff, contact with whom is greatly valued. Just as important is an ethical consideration: volunteers generously donate their time to *Transcribe Bentham* by transcribing, and suddenly changing the nature of the project by asking them to check transcripts as well—a service which has been provided for so long by experienced staff—would likely be perceived as directly exploitative and a breach of trust, would damage the volunteer/staff relationship, and potentially create problematic hierarchies within the volunteer transcriber community. As such, as long as *Transcribe Bentham* continues, transcripts will be checked by Bentham Project staff.

Yet *Transcribe Bentham* can still offer significant cost-avoidance potential, while maintaining staff support of volunteers. This can best be seen when comparing the potential cost of researchers transcribing the manuscripts against the cost of researchers checking volunteer-submitted transcripts. It is estimated that transcripts of around 100,000 pages will be required before the UCL and British Library Bentham Papers are fully transcribed. If a Senior Research Associate (UCL Grade 8, national UCU spine point 38)[36]—i.e. the level at which the project co-ordinator was then employed—transcribe the estimated 61,110 manuscript pages outstanding as of 30 September 2014, this would cost a minimum of £1,121,063, including on-costs (that is, including National Insurance and superannuation contributions).[37] This calculation assumes that it would take an average of 45 min to transcribe a manuscript, and at an average cost of £18.35 per transcript. It also assumes that a funding body or bodies would be willing to provide money purely to fund transcription for many years which is, to say the least, a forlorn hope.

By the close of Period B, it took an average of 141 s to check and approve a transcript, which works out at around £0.97 of a Senior Research Associate's time, including on-costs. If the checking task were delegated to a Transcription Assistant (UCL Grade

5 Professional Services staff, national spine-point 15), then the cost of checking the average Period B transcript would be approximately £0.52, including on-costs.[38] If hourly paid graduate students (UCL Grade 4, Professional Services staff, national spine point 11) were given the task, then the average Period B transcript could be checked for about £0.44.[39] These calculations do, of course, assume that the people at each of these grades have appropriate levels of experience and expertise, and that it would take them the same amount of time to check the average transcript, so these are 'best case' scenarios.

The cost-avoidance potential of *Transcribe Bentham* is particularly great in the case of lengthy and complex manuscripts. The transcript of folio 62 from Box 107 of UCL's Bentham Papers, for example, took 39 min and 44 s for a Senior Research Associate to check and approve, or about £16.20 of their time, including on-costs. Assuming that it would take the same amount of time for a Transcription Assistant or an hourly paid graduate student to check, this would amount to around £8.64, including on-costs, and £7.28, of their respective times. Had a Senior Research Associate been asked to transcribe this manuscript from scratch, then it would have taken perhaps 2 h, at a cost of around £50.

If, as noted above, it would cost at least £1,121,063, including on-costs, to employ a Senior Research Associate to produce the remaining 61,110 transcripts required, then Table 7 shows the potential costs which could be avoided if the remainder of the UCL and British Library Bentham Papers were transcribed by volunteers and checked by *Transcribe Bentham* staff at the three levels. It should be noted that these cost avoidance projections are for the checking and approving of transcripts only; they do not include the time required for the management of the Transcription Desk, nor the cost of hosting, maintenance, and regular upgrades of the transcription platform, nor of the long-term storage and management of data resulting from the project.

Even after taking into account the £589,000 of financial support already given to *Transcribe Bentham*, then there remains the potential to avoid costs of around £500,000 if the remainder of the Bentham Papers were transcribed by volunteers and checked by staff. In the longer term, there would be on-going, additional cost-avoidance as, when producing a volume of the *Collected Works of Jeremy Bentham*, time is built-in to each funding proposal for the identification and transcription of all pertinent manuscripts, which may be scattered throughout the Bentham Papers. Having available draft transcripts of all required manuscripts for a particular volume could save anywhere up to 6 months' worth of staff time per volume, and could have the effect of making such funding proposals more competitive. As at least another forty volumes of the *Collected Works* are required before the edition is complete, then the eventual cost-avoidance resulting from *Transcribe Bentham* will far outweigh the initial investment in the initiative. In addition, the public engagement value of the initiative is incalculable, and has contributed to a greater awareness of Bentham's life and thought, and a higher public profile for Bentham Studies, than ever before.

The increased rate of participation in, and efficiencies of, *Transcribe Bentham* have also caused us to revise our estimates of how soon the remainder of the Bentham Papers might be fully transcribed. Thanks to the work of *Transcribe Bentham*'s volunteers, that day could arrive sooner than anyone might ever have anticipated (Table 8). The Bentham Project began using electronic word processors to transcribe manuscripts in 1984 and since then to September 2010—i.e. before the advent of

Table 7. Potential cost-avoidance afforded by *Transcribe Bentham*, if the remainder of the Bentham Papers were transcribed by volunteers and checked by staff of the three above grades

Transcripts checked by	Total cost of checking transcripts	Potential cost avoidance
Senior Research Associate	£59,277	£1,061,786
Transcription Assistant	£31,777	£1,089,286
Hourly-paid graduate student	£26,888	£1,094,175

Transcribe Bentham—some 28,000 page transcripts were produced by Bentham Project researchers, at an average rate of 1,076 per year, dependent upon the availability (or otherwise) of funding, from a variety of sources, for editorial work. If *Transcribe Bentham* never existed, and assuming there was money available to fund a consistent rate of transcription, then the Bentham Papers would not be fully transcribed until 2081 at the very earliest.

We previously estimated—based on our earlier, limited data—that if volunteers continued to transcribe at the rate they had done from the launch of *Transcribe Bentham* on 8 September 2010 to 19 July 2013, that is, at a rate of 2,024 transcripts per year, then the remainder of the Bentham Papers could be fully transcribed by 2049 (Causer and Terras, 2014b). If we now extend this analysis to encompass 8 September 2010 to 30 September 2014, i.e. up to the end of the Mellon Foundation grant, volunteers worked on an average of 2,704 transcripts per year. If that pace could be maintained, then the Bentham Papers would be completely transcribed in 2036—considerably sooner than our previous best estimate.

However, should volunteers maintain the rate of transcription which they managed between 1 January and 30 September 2014, when they worked at a rate of 5,564 transcripts per year, then the Bentham Papers could be fully transcribed by 2025. The prospect of providing digital access to a fully transcribed Bentham Papers, a resource of enormous historical and philosophical importance, to researchers and the general public by the mid-2020s, was an impossibility only a decade ago. This would be a remarkable achievement, and a true testament to the skilled and engaged work of *Transcribe Bentham*'s volunteers.

Table 8. Projected dates at which the remaining untranscribed portion of the UCL and BL Bentham Papers (estimated 61,110-page transcripts as of 30 September 2014) would be completed, comparing transcription rates

	Average number of transcripts per year	Earliest date when all pages would be transcribed
Without *Transcribe Bentham* (i.e. if all transcription was done by researchers)	1,076	2081
Overall *Transcribe Bentham* transcription rate (8 September 2010—30 September 2014)	2,704	2036
1 January 2014—30 September 2014 *Transcribe Bentham* transcription rate	5,564	2025

5. Conclusion

Crowdsourcing is not a panacea. To be successful, it must be carefully planned and integrated into a wider research agenda and public engagement strategy, rather than simply being done for its own sake. The rationale for crowdsourcing must be clearly explained and articulated to volunteers: after all, why would anyone choose to get involved if there was no defined use and end result for the data? It should also be acknowledged that there is always the risk, despite the most careful planning, that a project may fail to attract sufficient numbers of volunteers, or volunteers may not participate in a consistent manner over a long period of time.

Transcribe Bentham has, we believe, demonstrated the potential benefits of crowdsourced transcription for large manuscript collections, which include public engagement with research and scholarship, and significant cost-avoidance. A key finding is that improving the Transcription Desk did not increase the rate of participation, and that an interface in and of itself is unlikely to be a significant factor in recruiting regular contributors to a project. The Transcription Desk is, of course, vital in supporting the work of Super Transcribers and infrequent contributors alike, and improvements made were in response to their suggestions and requests for functionality. The task was made more straightforward for volunteers, and the reduction in encoding errors which the improvements facilitated made the quality-control process more straightforward and more efficient for project staff, and hence increase *Transcribe Bentham*'s cost-avoidance potential.

In the case of *Transcribe Bentham*, content was the key. It was availability of new and varied

manuscripts in the shape of the British Library's Bentham correspondence, which joined the important philosophical material, and helped to generate publicity, draw in new volunteers, and drive a dramatic increase in the rate of participation. Any successful crowdsourcing project must, we conclude, marry an excellent interface which can be altered in response to the needs of users, with exciting and interesting content. The Bentham correspondence has helped to promote a more nuanced picture of Bentham himself. Here was a man with a keen sense of humour, for instance, as he teasingly told his friend John Lind in 1776: 'A bottle of burgundy I have reserved to moisten your fat guts with'.[40] The work of volunteers is helping to undermine the reputation with which Bentham has long been saddled, that of a cold calculator of pleasures and pains.

Our experience of *Transcribe Bentham* carries with it other general recommendations for large-scale crowdsourcing for cultural heritage. Such a programme is most likely to become fully efficient and effective in the long-term, and should be thought of as such. Volunteers should be supported by a point, or points, of contact, in the form of a moderator or project manager, to encourage participation and ensure that they feel valued. The sustainability of the crowdsourcing platform must be considered, and the platform improved and updated in the light of volunteer feedback. All of this requires an ambitious and well thought-through project plan at the very beginning, and ongoing institutional support, commitment, and resources to successfully meet the crowdsourcing programme's goals, or it is unlikely that the cost-avoidance or, indeed, any other aims will be obtained.

Crowdsourced transcription is now an integral part of the work of the Bentham Project, and the creation of the new edition of the *Collected Works of Jeremy Bentham*. Volunteer-produced transcripts have proven to be of an extraordinarily high standard, and *Transcribe Bentham* will, in the long-run, be cost-effective, despite the initial heavy investment. *Transcribe Bentham* has also led to participation in the European-funded *tranScriptorium*[41] and Recognition and Enrichment of Archival Documents (READ)[42] projects, which are developing and exploiting solutions for the indexing, searching and full transcription of historic handwritten manuscripts using modern Handwritten Text Recognition (HTR) technology. We could never have anticipated that the work of volunteer transcribers would be used as 'ground truth' data for training HTR models, or that we would envisage and test a transcription interface in which volunteers could ask an HTR engine for suggestions for words which they were struggling to decipher.[43] The prospect of making this technology available to volunteers could lead to further, unanticipated, efficiencies and cost-avoidance in the future.

In summary, it is clearly a complex task to evaluate the efficiencies and economics of cultural heritage crowdsourcing. This article has offered several metrics which might be used in evaluating the success (or otherwise) of such endeavours, in terms of the cost of crowdsourcing, the time spent checking submissions, and the quality of the work produced by volunteers. These metrics may be of general use when conceptualizing crowdsourcing in the cultural and heritage sectors. While it has taken a little time and patience, and a not inconsiderable amount of money, to get to this point, *Transcribe Bentham* is now more successful than ever. For the field of crowdsourced transcription more generally, we might well conclude that if we can successfully crowdsource Bentham's manuscripts, then we can conceivably crowdsource anybody of historical documents.

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Notes

1 This quotation is from J. Bentham (1787). *Defence of Usury; Shewing the Impolicy of the present legal restraints on the terms of pecuniary bargains*. London, p. 2.

2 At 10:30 a.m. BST on 5 August 2015, there were 1,626 'Human Intelligence Tasks' available for Amazon *Mechanical Turk* users to choose from. Over a hundred offered no payment at all, and around 600 offered a reward of somewhere between US$0.01 and $0.10.

3 https://turkopticon.ucsd.edu (accessed 30 July 2015). The neologism 'Turkopticon' does, of course, invoke Bentham's panopticon prison scheme, in which transparency was a fundamental principle.

4 Chandler and Kapelner (2013) found that where *Mechanical Turk* workers were told that their contributions were 'meaningful', such as 'helping cancer researchers identify tumor cells', then the workers increased the quantity of their work (though there was no change in its quality).

5 http://www.ucl.ac.uk/bentham-project/ (accessed 12 August 2015).

6 http://www.tei-c.org/index.xml (accessed 11 April 2016).

7 http://www.ucl.ac.uk/library/bentham (accessed 2 August 2015).

8 The first two volumes of the *Collected Works* were published in 1968.

9 Bentham worked on the Thames Police Bill with the London police magistrate, Patrick Colquhoun. It was enacted in 1800, establishing the Thames River Police as the first regular, professional police force in the world.

10 Quinn, 'Box 150: progress update' (2015). The Treason Act of 1795 (36 Geo. III. c.7) made it high treason for an individual to plot or attempt to inflict harm, death, or imprisonment upon the monarch. It was accompanied by the Seditious Meetings Act (36 Geo. III. c.8), which made it illegal to hold a public meeting comprised of more than fifty individuals.

11 Funding from the Mellon Foundation also provided for the creation of detailed metadata for the British Library's Bentham Papers.

12 For an up-to-date account of *Transcribe Bentham*'s progress, see the regular progress updates issued at http://blogs.ucl.ac.uk/transcribe-bentham/.

13 Jeremiah Bentham (1712–92) was a lawyer, but derived most of the family's income through property.

14 Alicia Grove (d. 1759) and Jeremiah Bentham married in 1745. They had seven children, but only Jeremy and Samuel survived childhood.

15 Samuel Bentham (1757–1832) was the youngest of Jeremiah and Alicia's children.

16 Maria Sophia Fordyce (1765–1858) married Samuel Bentham in 1756. She prepared and edited Samuel's biography, which was published in 1862.

17 George Bentham (1800–84) was a botanist and fellow (and later, president) of the Linnaean Society. He lived for a while with his uncle, Jeremy, and edited some of his works. Jeremy, being unmarried and childless, left much of his estate to George.

18 A typical UCL Bentham manuscript may not, taken on its own, make a great deal of sense. It is only when it is compiled and edited into a larger and coherent text that is significance is likely to become clear.

19 These two transcribers had, by 30 September 2014, worked on 380 transcripts between them.

20 Jeremiah Bentham to Alicia Bentham, 26 April 1750, http://www.transcribe-bentham.da.ulcc.ac.uk/td/JB/537/011/001 (accessed 3 August 2015).

21 Jeremiah Bentham to Alicia Whitehorne, 24 August 1745, http://www.transcribe-bentham.da.ulcc.ac.uk/td/JB/537/004/001, transcribed by Peter Hollis, version dated 11.21, 31 March 2014. The letter continues across the next five pages.

22 For the demographics, motivations, and interests of *Transcribe Bentham* volunteers, see Causer and Wallace, 2012. For the demographics and interests of *History Today* readers, see the magazine's advertising information pack at http://www.historytoday.com/sites/default/files/HT.MediaPack2015.pdf (accessed 3 August 2015).

23 It is also important to keep accurate records of the work carried out by volunteers, to recognize their work where required (for example, in the preface to a volume of Bentham's *Collected Works*).

24 http://www.transcribe-bentham.da.ulcc.ac.uk/td/JB/116/396/001, transcribed by Lea Stern, revision dated 01.36, 28 November 2012. This is the version of the transcript submitted by the volunteer transcriber, prior to any editorial intervention.

25 'Q.S.P', an acronym for the Bentham family home at Queen's Square Place, Westminster, into which Bentham moved when his father, Jeremiah, died in 1792. In their letters, Jeremy and his younger brother Samuel frequently referred to Jeremiah as 'Q.S.P'.

26 Sir (Thomas) Charles Bunbury (1740–1821), Member of Parliament for Suffolk, 1761–84, and 1790–1812. Bunbury was interested in prison reform and convict transportation, and corresponded with Bentham on these topics.
27 It should be noted that the recorded time spent checking a transcript does not include time expended upon creating XML files, providing feedback to users, updating the website, nor actually recording the data itself.
28 Based on 4,364 checked and approved transcripts.
29 Compare revision dated 12.40, 20 December 2012 (checked by *Transcribe Bentham* staff) with that dated 16.07, 19 December 2012 (submitted by Peter Hollis), http://www.transcribe-bentham.da.ulcc.ac.uk/td/index.php?title=JB/100/001/001&action=history.
30 For example, http://www.transcribe-bentham.da.ulcc.ac.uk/td/JB/538/395/001, transcribed by S.D. Croft, revision dated 16.54, 7 May 2015.
31 For example, http://www.transcribe-bentham.da.ulcc.ac.uk/td/JB/541/193/001, transcribed by S.D. Croft, revision dated 16.23, 5 August 2015.
32 It must be noted that all times given in this article are for the checking of transcripts only. They do not include time spent maintaining and updating the website, creating XML files of the transcripts, supporting volunteers, publicity, and other tasks associated with running a project like *Transcribe Bentham*.
33 Based on 3,404 transcripts for which data were available.
34 *Transcription Desk* code, https://github.com/onothimagen/cbp-transcription-desk. For implementations of the Transcription Desk, or parts thereof, please see the *Edvard Munchs Tekster Digitalt Arkiv*, http://www.emunch.no/wiki/index.php/Edvard_Munchs_tekster, and *Letters of 1916: Creating History* project, http://dh.tcd.ie/letters1916/about/acknowledgements/. All accessed 2 August 2015.
35 *Scripto*: http://scripto.org/; *FromThePage*: http://beta.fromthepage.com/. Both last accessed 11 May 2016.
36 For the salary scale, see http://www.ucl.ac.uk/hr/salary_scales/final_grades14-15.php (accessed 10 April 2016).
37 The total cost of this is likely to be somewhat greater, as the figure does not take into account the staff member's progression through UCL's salary spine points, nor inflation and other salary increases over time, and so the cost of employing them would typically increase each year until they reach the top of Grade 8. This progression through the scale and subsequent increase in the cost of employment is also applicable to the Transcription Assistant and hourly paid graduate students discussed below. See the UCL salary grade structure at http://www.ucl.ac.uk/hr/salary_scales/final_grades.php (accessed 12 April 2016).
38 A Transcription Assistant would, typically, be a graduate student.
39 On-costs are not applicable to hourly paid staff.
40 Bentham to Lind, 12 September 1776, http://www.transcribe-bentham.da.ulcc.ac.uk/td/JB/538/058/002, transcribed by Ohsoldgirl, revision dated 17.13, 8 April 2014. See also Wheatley (1831, 2015), in which the elderly Bentham exhibits a pleasingly sarcastic sense of humour.
41 http://transcriptorium.eu (accessed 4 August 2015). *tranScriptorium* ran from 1 January 2013 to 31 December 2015.
42 http://read.transkribus.eu (accessed 12 April 2016). *READ* runs from 1 January 2016 to 31 December 2018.
43 *TSX*, http://www.transcribe-bentham.da.ulcc.ac.uk/TSX/desk (accessed 5 August 2015).
44 The period funded by the Mellon Foundation is divided into the sections. The first highlighted section (1 October 2012 to 14 July 2013) indicates the period in which volunteers used the first iteration of the Transcription Desk, while the second highlighted section (15 July 2013 to 30 September 2014) indicates the period in which volunteers used the second iteration.
45 Data were available for 1,288 transcripts submitted during Period A, and 3,076 submitted during Period B. The jagged lines indicate a change of scale on the chart.
46 Data were available for 1,288 transcripts submitted during Period A, and 3,076 submitted during Period B. The jagged lines indicate a change of scale on the chart.
47 Though 4,363 transcripts were checked and approved from 1 October 2012 to 27 June 2014, data were available for 4,309 of them owing to a software crash. The jagged lines indicate a change of scale.
48 Manuscripts which were penned by more than one person, e.g. a fair-copy manuscript which was annotated by Jeremy Bentham, were discounted from these calculations. 'Fair-copy manuscripts' refers to those written by unknown copyists, as well as Jeremy Bentham's known amanuenses John Flowerdew Colls, Richard Doane, Richard Smith, and John Koe.
49 The 'average time spent checking a transcript' was based on a calculation using transcripts for which data were available. That there is a discrepancy between the number of transcripts checked and approved, and the number for which data are available, is owing to a software crash and the loss of recorded data.