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Abstract

Interdisciplinary working plays an important role in achieving impact outside academia. One barrier to interdisciplinary working is the lack of mechanisms to assess contributions from outside the primary discipline. Positioning our research in debates about knowledge translation, we analyse the ability of narrative cases to assess the interdisciplinary contribution of one academic discipline, Human Resource Development (HRD), to impact. We take the example of the cases used to assess impact in the UK's 2014 Research Excellence Framework evaluation (REF 2014). While the narrative cases revealed the complexity of knowledge translation and the role of HRD practice in it, their authorship by a single discipline imposed a linear structure and prevented interdisciplinary contributions from HRD academics from being recognised in the formal assessment. To facilitate assessment of interdisciplinary contributions to academic impact, we propose remodelling the knowledge translation process as a net of cases rather than a single chain.

Introduction

The argument has long been made that academic research should have an impact on practice outside academia (Rynes et al. 2001). Interdisciplinary collaboration, it has been suggested, can make an important contribution to achieving that impact (Watermeyer 2014, 2016). While in multidisciplinary research different academic disciplines remain within their boundaries and make contributions from their different perspectives, interdisciplinarity involves sharing of purpose and methods and a recognition that the theories, perspectives, tools and findings of one discipline cannot always solve or illuminate the problem it is trying to solve (Townsend et al. 2015, 660).

In the context of achieving impact from academic research, this requires one discipline working with another discipline to achieve effects outside academia. Literature on knowledge translation indicates that researchers may not always have the resources or skills to translate knowledge to the user and greater impact could be achieved through the use of 'brokers' with specific expertise (Grimshaw et al. 2012). Given they bring different expertise, such brokers are likely to be drawn from an alternative discipline such as Human Resource Development (HRD).

The assumption that academic research has wider societal benefits has been challenged (Bornmann 2013), leading to calls to assess the impact of academic research (Penfield et al. 2014). However, the mechanisms by which interdisciplinary contributions to impact such as those involving brokers might be assessed remain unclear, raising the possibility that some academic researchers' contributions to impact go unrecognised, and some key stages of knowledge translation are ignored. A number of different mechanisms for assessing impact have been used as ways of broadening its assessment, including altmetrics (Hammerfield 2014), econometric studies, surveys and case studies (Salter and Martin 2001). While case studies have been criticised (Milat et al. 2015), it has been argued that they are best able to identify the innovation process (Salter and Martin 2001) positioning them as potentially appropriate for identifying the different stages of the knowledge translation process and interdisciplinary contributions to it. Thus, our research question is: 'To what extent can narrative case studies assess interdisciplinary contributions to academic impact through the knowledge translation process?'

In the UK, the case study approach was adopted to assess external impact in the UK government's 2014 evaluation exercise, the Research Excellence Framework (REF). This paper therefore explores whether the narrative case studies adopted by the REF were able to capture the complexity of the knowledge translation process and the roles of diverse disciplines within it. Our first aim is therefore to:

(1) identify the strengths and weaknesses of using narrative case studies to assess interdisciplinary contributions to academic impact

One model which specifically seeks to enable the contributions of academic researchers from different disciplines to be assessed is the Knowledge-Translation Value Chain (KTVC) (Thorpe et al. 2011). Using this model, Thorpe et al suggest, researchers can identify where they contribute to the knowledge translation process, as a basis for assessing their contribution to academic impact. However, as Thorpe et al. (2011) acknowledge, their model adopts a linear format which does not reflect the complexity of interactions in the knowledge translation process. The assumption that research is the starting point of impact (Anderson et al. 2017), and that the process follows a linear pathway from research to practice has been criticised (see for example Rau et al. 2018), leading to calls to reconceptualise the process as a network (Watermeyer 2014). Given the KTVC is proposed as a mechanism for assessing these different disciplinary roles but is recognised by the authors as limited due to its linear form, our second aim is to:

(2) propose a revised KTVC model which could enable assessment of interdisciplinary contributions to academic impact through narrative case studies.

To achieve these aims, we focus on the interdisciplinary contribution of one particular discipline, Human Resource Development (HRD). We focus on training and learning and development since it is a core HRD activity (McClean and McClean 2001) and has been identified as a key intervention in

knowledge translation (Grimshaw et al. 2012; Mallidou et al. 2018). This suggests that academics from this discipline may have the expertise to act in an interdisciplinary role as knowledge brokers. Our specific objectives are to:

- identify how the role of HRD in the KTVC is presented in the UK REF2014 impact cases;
- analyse how the requirements of the UK REF 2014 impact cases facilitated or hindered the assessment of HRD's interdisciplinary contribution to the KTVC

Our findings suggest that narrative cases are able to reveal the role of different stakeholders in knowledge translation activities. However, we find that their narrative imposes a linear structure on knowledge translation which locates the key contribution to knowledge translation in the authoring discipline and prevents interdisciplinary contributions from being recognised in formal assessments of impact. We argue that these findings form the basis for empirical, theoretical, practical and methodological contributions. First, we identify the existence of KTVC activities and the important potential role of interdisciplinarity in these. Second, we develop the KTVC to form a new model that envisages knowledge translation as a net of interlocking cases. Third, we identify practical implications of this for HEIs and academics undertaking interdisciplinary work. Finally, we propose how this new model might be used within assessment exercises to encourage, recognise and assess interdisciplinary contributions to academic impact.

Using narrative case studies to assess impact

As indicated above, increasing attention has been paid to assessing whether the impact desired from academic research is achieved. A range of strategies for assessing that impact have been adopted, for example in the work of McNie et al. (2016) who produced a systematic and detailed typology of research activities and expectations. That typology usefully addresses a 'Spectra of Research Criteria' which specifies continuums of values important to science and to users, but with a limited focus on knowledge exchange and impact as only one of fifteen attributes of research activity. An alternative proposed mechanism, which would enable the knowledge translation process and thus the role of interdisciplinary contributions to it to be assessed, is that of case studies. Using case studies to assess impact does however have some challenges. While located in a very particular research context of sustainability, Wiek et al. (2014) identify challenges which may well be experienced more widely; for example, case identification and selection; tracking participants; memory distortion; and researcher bias. Narrative case studies in particular are not unproblematic. They may be expensive, unfeasible, and subject to bias, particularly when written retrospectively (Banzi et al. 2011). This bias may be inherent in narratives, which have been described as telling 'a sequence of events that are significant for the narrator… and his or her audience' (Denzin 1989, 37). As such they have 'a plot, a beginning, a middle and an end … internal logic that makes sense to the narrator' (ibid.) However, as Barthes has argued, logic is only 'apparent', in that it is culturally-determined (Barthes 1981, 156), and narratives have functions which are context-specific (Coffey and Atkinson 1996).

Nevertheless, case studies can provide a useful focus for the evaluation of impact, with specific aims against which impact can be assessed (Banzi et al. 2011). They can also incorporate a range of quantitative and qualitative indicators, (Searles et al. 2016; Wilkinson 2017; Rau et al. 2018). While Morrell et al. (2015) note that evidence-based management literature has tended to view qualitative evidence to be lower order than quantitative evidence, they argue that the two are equally valid, and that qualitative evidence is essential for developing understanding and generating theory. Qualitative evidence is particularly effective, for example, in identifying the complex pathways by which knowledge is translated into practice (Searles et al. 2016). Such evidence may therefore be a particularly useful mechanism for identifying the role of different disciplines in achieving impact as shown by, for example, Rau et al. (2018).

The first attempt to assess research impact across all subject disciplines was undertaken for the Australian Research Quality Framework (Penfield et al. 2014) utilising a case study format. Although never fully implemented, the pilot exercise indicated that reviewers could obtain sufficient data from cases to assess research impact (ibid.). The case study approach to impact assessment was subsequently adopted by the UK government for its 2014 REF. Adopting a pluralist approach to evidence (Aguinis et al. 2014; Morrell et al. 2015), the UK Higher Education Funding Council for England (HEFCE) proposed that:

Case studies will be submitted using a generic template with word limits. This will be designed to enable institutions to clearly explain and demonstrate the impacts through a narrative that includes indicators and evidence as appropriate to the case being made' (HEFCE 2011, 4).

Impact was defined as:

An effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia' (HEFCE 2012, 26).

Academic disciplines were categorised into 36 Units of Assessment (UOAs), and submissions from each UOA included the impact case studies which had to be underpinned by excellent research, along with an overall statement describing and justifying the strategies for enabling impact. In total 6637 cases were submitted. Following REF2014 the decision was made to retain impact case studies for the next iteration of the REF, due in 2021, with their weight in the overall REF increased from 20% to 25%. Again, they must be underpinned by excellent research (HEFCE 2017).

Analysis of the 2014 REF impact cases revealed the use of testimonials, websites, policy influence, evaluations, media, citations, products and companies to evidence impact (Wilkinson 2017). The balance of evidence submitted varied by discipline, with cases submitted to the Business and Management UOA, for example, placing a much greater reliance on qualitative than quantitative evidence, and around 80% of the cases including at least one testimonial (Hughes et al. 2017). A synthetic analysis of the population of impact case studies submitted to the REF indicated that the case study approach had indeed enabled a range of impacts to be identified which might not have been revealed by other methods (Kings College London and Digital Science 2015). However, limitations of the case studies were noted. Moreover, the small number of case studies selected by submitting institutions has led to questions about the REF's representation of academic impact (Watermeyer 2016).

Mapping of the fields of research, units of assessment and types of impact revealed a huge diversity of impact pathways, indicating the multidisciplinary nature of the research and the multiple impacts to which it led (Kings College London and Digital Science 2015). However, the illustration of the pathways assumed a linear progression from research to practice, and the focus on fields of research, units of assessment and types of impact meant that the research did not elucidate the processes by which the research was translated into practice, or the roles of other disciplines in those processes.

Hughes et al.'s (2017) analysis of the business and management UOA cases provides greater detail of the variety of mechanisms involved in routes to impact, including government reports, professional associations, and user workshops and training, indicating the involvement of a range of stakeholders. Nevertheless, the analysis again implies a linear process. Indeed, a survey of UK academics prior to REF criticised the research to practice case study approach for inferring a linear pathway from research to impact. This questioned its ability to identify interdisciplinary contributions to impact, or the complexity of the processes involved (Watermeyer 2014). In taking published underpinning research as their starting points, it has been argued that the REF case studies marginalise other academic disciplines which may have been involved in translating the knowledge into impact (Anderson et al. 2017). Literature on knowledge translation seeks to identify those processes and in so doing the role of different stakeholders in them. This paper therefore now explores that literature.

Knowledge translation

While recent research has shown the complexity of such processes (Rau et al. 2018), many models of knowledge translation assume a linear pathway from research to practice. Fredericks et al. (2015) identify two forms of knowledge translation: 'End-of-Grant', where research findings are disseminated to practitioners after the research has been completed, and 'Integrated', in which key research users are involved throughout the research process, helping to 'apply science to practice accurately' (157). Although the role of the user differs, both infer the linear and 'accurate' translation of academic knowledge to practice. Grimshaw et al. (2012) assume a similarly linear process and claim that 'Researchers typically carry the responsibility for conducting knowledge translation' (3-4). However, they argue that knowledge translation might be made more effective by involving others, such as 'documentation specialists, data analysts, knowledge brokers', and developing infrastructures such as training programmes (26). The role of these other stakeholders in knowledge translation is inferred to be as conduits for academic knowledge, and the relationship between researcher and user is one in which the former gives knowledge to the latter (Anderson et al. 2017). There is no consideration of other contributions that other disciplines might make to the knowledge translation process.

By contrast, Kothari and Wathen's (2013) definition of integrated Knowledge Translation conceives of research users as involved at all stages from the initial shaping of research questions to dissemination. This implies a role for other stakeholders not merely as recipients of, or vehicles for, the accurate delivery of knowledge, but as active participants in a process of knowledge transformation (Waerass and Nielsen 2016). In this conceptualisation the separation of knowledge and its translation is impossible (Engebretsen et al. 2017) and translation becomes a process during which meanings are negotiated and changed (ibid; Waereass and Nielsen 2016). Rather than facilitating the linear, unidirectional translation of knowledge, brokers such as IT professionals and project leaders are involved in translating knowledge 'in different directions' (ibd., 237), suggesting a greater potential for academics and research from other

disciplines to affect the process. However, existing research rarely identifies exactly how these other stakeholders are involved in the knowledge translation (Gagliardi et al. 2018) and thus what the interdisciplinary contribution is.

Thorpe's et al.'s KTVC model (2011) seeks to conceptualise the roles of these diverse stakeholders in the translation and modification of knowledge in the KTVC. Whilst encompassing both users and researchers, their particular focus on the contribution of different academic disciplines to knowledge translation and how that might then be assessed during research assessment exercises makes it particularly pertinent to our research aims.

[Insert figure 1 here]

This model sets out 5 stages of knowledge translation, each with different assessable outputs and in which different stakeholders may be involved. First, *Theory Development* (KT0) is where research is reported in academic contexts. Second, *Theory-to-Practice* thought experiments, (KT1) involves discussions with other academics regarding possible implications for practice and dissemination in practitioner-focused media. Third, *Engagement of Users* (KT2), involves identifiable users, with outputs such as measurable performance improvements and reports. Widespread *Dissemination* (KT3) then involves wider, largely industry-focused dissemination of the research, leading perhaps to the development of innovation laboratories and new curricula and assessed by industry-level reports. Finally, the *Services and Support* stage (KT4) makes tools and information widely available to the public for them to adopt for themselves. Suggested assessable outputs here include web publications, consultancy aids and the use and development of applicable tools.

Different stakeholders may play a role at different stages of the chain (Thorpe et al. 2011). Thorpe et al argue for collaboration between academic institutions, such that some may deliver earlier stages of the value chain while others deliver later stages. They suggest that the REF (the format of which had not been finalised at the time) should enable each institution's actions to 'count' as having impact (427).

The KTVC also suggests that assessment of outputs at each stage might feed back into the earlier development of theory, noting that those who put theory into practice 'so also contribute to the redevelopment of theory' (Thorpe et al., 429). However, they note that their linear presentation does not reflect that 'the actual order and interplay of translation episodes will be more complex' (ibid). Anderson et al. (2017) criticised the metaphor of the 'chain', and the linear relationship between separate activities of research and practice. While the KTVC identifies the contributions different academic disciplines may make to knowledge translation, it does not avoid the traditionally linear conception of knowledge translation criticised above.

Other researchers have also identified possible interdisciplinary contributions to the translation of academic knowledge to impact (Mårtensson et al. 2016; Rau et al. 2018). Given the identifiable role of training and development interventions in knowledge translation (Grimshaw et al. 2012) and the development of knowledge translation competencies (Mallidou et al. 2018), we focus on the discipline of Human Resource Development (HRD), to analyse the ability of the REF cases to evaluate its contribution to academic impact.

The definition of HRD has been the subject of much debate (Stewart and Sambrook 2012; Werner, 2014). Bernthal et al. (2004) identify three main areas of HRD: training and development, career development and organizational development. The Chartered Institute of Personnel and Development (CIPD), the

professional body for HRM and HRD in the UK, incorporates those HRD areas within its overall map of 8 HR professional areas. (CIPD 2018). While there is some overlap between Bernthal's HRD areas and CIPD areas, those CIPD areas most closely related to Bernthal's are organisation development and learning and development. For the purposes of this paper, and given the role of training and development activities in knowledge translation (Grimshaw et al. 2012), we limit our analysis of HRD to the CIPD's learning and development professional area.

Methods

This paper is based upon analysis of the impact cases available from the REF2014 impact case studies database (REF2014 no date). We adopt a social constructionist approach to analyse the claims made for impact constructed by scholars submitting to REF2014, and how those claims are evidenced.

Building on earlier research (Ross et al. 2019) two coders undertook content analysis of the population of 6637 case study summaries across all UOAs. This identified cases where HRD, focusing on the CIPD's learning and development professional area, was the *subject* of the impact. Also, to establish whether the case studies were able to capture contributions at intermediate stages of the KTVC, the coders identified cases where HRD was presented as a *vehicle* for delivering impact, even if the subject of the underpinning research and the impact was in another discipline. A low inference system of coding was adopted to improve reliability (Robson 2002). The first coder excluded cases where it was not clear if HRD was involved.

To provide further detail of the contributions to impact HRD was able to claim outside its disciplinary home, we explored the nature of HRD involvement claimed outside the Business and Management (B&M) and Education UOAs, and the evidence presented for this. B&M and Education were excluded as they are the university schools or departments in which HRD is most often located (Sambrook and Willmott 2014). We analysed one full case study from the remaining four UOAs with the highest number of cases where HRD was the subject, and one each from the four with the highest number of cases claiming to use HRD as the vehicle of impact (n=8). Purposive sampling was used to identify cases where there was substantial detail of HRD interventions. The roles claimed for HRD were then mapped against the five knowledge translation stages of the KTVC model to identify where HRD involvement was presented.

Findings

In 77 (1.16%) of the cases HRD was clearly the subject of the impact. Of more relevance here is the finding that 789 (11.89%) of cases described using HRD, in the form of learning and development, to deliver impact, including at least one case from each of the 36 UOAs.

Tables 1 and 2 present the detailed analyses of the eight cases in which HRD was the subject or the vehicle of impact, mapping them against the KTVC stages and indicating their chronological order; whether and how HRD was involved at each stage and HRD outputs presented.

'Place table 1 here'

Table 1 presents analysis of the four cases where HRD was the subject. In each case a role for HRD was therefore identified in theory development (KT0), although this was not always the first stage of knowledge translation. Evidence was provided predominantly through academic publications. Three of the

four cases claimed a role for HRD in *Theory to Practice Thought Experiments* (KT1), evidencing this internal impact with practitioner-focused publications, academic networking events and evidence of their findings influencing other researchers' publications. The fourth case provided no evidence of this stage.

All four cases provided evidence of engaging users in prescribed contexts (KT2) and HRD's involvement in this, citing reports, user testimonies of improved performance, the implementation of training, and invitations to undertake further consultancy. The Psychology case provided no clear evidence of knowledge translation beyond this point, although the other three cases did provide evidence of industry-level knowledge-translation through further testimony of improved performance and the existence of courses and industry-level presentations and seminars. These activities clearly indicate a role for HRD at this stage. These three cases also claimed to have provided wider impact through the final services and support stage of the KTVC (KT4), through HRD interventions such as provision of on-line training aids and the adoption of their research by individual practitioners to change their practice. These were evidenced by the number of users of training aids, user testimonies, and discussions in practitioner blogs.

None of the four cases provided evidence of all stages of the KTVC being undertaken in the chronological order suggested in the KTVC model. The Psychology case provided evidence of only the first three stages; the Social Work case started with *User Engagement and Wider Dissemination* which then informed *Theory Development*, and therefore omitted the *Theory to Practice Thought Experiments*, and the Allied Health and Sports cases both undertook *Wider Dissemination* at an earlier point in the chain. In summary, where HRD was the subject of the case, a role for HRD was presented in each of the KT stages identified. The diverse chronological sequencing moreover challenged the suggestion that HRD's role outside KT0 was solely as a passive vehicle for knowledge delivery.

'Place table 2 here'

In the four cases where HRD was identified as a vehicle for delivering impact (Table 2), the first involvements were in assisting the engagement of users at KT2. Three of the four cases identified a role for HRD at this stage through development interventions. In two cases these were evidenced through performance measures, while the third case provided evidence of learner engagement through impact on procedures and number of individuals who attended the interventions.

Three of the cases claimed a role for HRD in wider dissemination at KT3, through interventions such as action research, reflective learning groups and the development of educational materials. While one case provided evidence of changes to procedures arising from these interventions, none measured any improvement in performance, and other evidence related to the production of action plans, numbers of trainees, and evidence of impacting education. Only two cases claimed the final KT stage. One claimed that the research had been used to inform new practitioner-led research projects and by other educators to develop professional education. The second claimed that they had been used by others to produce training manuals and for continuing professional development. The outputs presented were testimonials of influence and the existence of the training materials.

Although no role was claimed for HRD in the first two KT stages in these cases, all but one of the later KT stages identified in the cases involved HRD. The analysis also again revealed that the chronological order of the stages varied; some stages occurred simultaneously, and others did not occur. In two cases later stages involving HRD occurred before theory development.

Discussion and Conclusions

This paper set out to answer the question: 'To what extent can narrative case studies assess interdisciplinary contributions to academic impact through the knowledge translation process?' by focusing on the example of HRD within the UK REF2014 impact assessment. Our aims were to i) identify the strengths and weaknesses of using narrative case studies to assess interdisciplinary contributions to academic impact and ii) propose a revised KTVC model that could enable assessment of interdisciplinary contributions to academic impact through narrative case studies. We have focused on HRD, as training and development has been identified as a key intervention in knowledge translation (Grimshaw et al, 2012), and thus HRD professionals are potential brokers in the process.

Our first aim was addressed through two specific objectives. Regarding our first objective, to identify how the role of HRD in the KTVC is presented in the UK REF2014 impact cases, we find that a number of cases present HRD as the subject of the underpinning theory and impact, so claiming a role for it at KT0 of the KTVC. However, more cases present HRD as a vehicle for delivering the impact, with over 10% of cases doing so. The case study analyses provide examples of this vehicle role addressing all other stages of the KTVC, supporting claims that HRD should form part of research knowledge infrastructure (Grimshaw et al. 2012).

Moreover, when HRD is used as a vehicle we find that its role is not only as a passive conduit of academic knowledge but can also transform that knowledge, often through facilitating the engagement with users which Thorpe et al. (2011) argue is a key part of the knowledge translation process. This is particularly evident in the later stages of the KTVC, most notably in the Theology case where it was used to develop an action research project based on the research, and in cases where those later stages occurred before theory development. This supports conceptualisations of knowledge translation as a process of negotiation and transformation rather than solely passive transmission of meaning (Waerass and Nielsen 2016) and recognition of the parts played by research users as well as academics (Morton 2015; Fredericks et al. 2015). It also provides evidence of the important role of 'brokers' such as HRD in facilitating knowledge translation.

Regarding our second objective, to analyse how the requirements of the UK REF 2014 impact cases facilitated or hindered the assessment of HRD's contribution to the KTVC, tables 1 and 2 indicate that allowing qualitative as well as quantitative evidence made it possible to present contributions of HRD practice to impact. This appeared to be particularly the case at later stages of the KTVC. For example, given that the final KT stage, services and support, goes beyond impact at organisational or industry level, and enables users to use the intervention for their own ends, it might be difficult to measure the extent of impact quantitatively. Half of the cases analysed which claimed a contribution for HRD at this KT stage therefore relied upon testimonial evidence.

Moreover, our findings supported claims that the narrative case study approach enabled the complexity of impact pathways to be identified (Aguinis et al. 2014), and thus made visible the role of HRD practice in the KTVC.

However, while the REF requirements made it possible to identify the contribution of HRD practice to the KTVC, they did not similarly enable identification of the contribution of HRD academics and research. The requirement to present case studies 'underpinned by excellent research' (HEFCE 2011, 1) implied that academic research was the starting point of the KTVC, thus encouraging the adoption of a particular narrative sequence (Denzin et al. 1989; Watermeyer 2014). The requirement to relate impact to the discipline that undertook the underpinning research meant that the function of the narrative (Coffey and Atkinson 1996) became one of demonstrating impact that had arisen from that discipline's research. There was no requirement for writers of the case studies to recognise any contributions HRD research (as opposed to practice) had made to other stages of the KTVC, supporting observations that identify the marginalisation of other academic contributions by the REF (Anderson et al. 2017). Not only is it unclear whether HRD academics made such contributions, as brokers, crucially it would appear there was no incentive for them to do so.

This lack of incentive for HRD academics to be involved in other stages of the KTVC leads us to question the ability of the REF narrative impact cases to enhance academic impact, (Penfield et al. 2014). If academics and their research from those disciplines presented as vehicles for delivering impact are not contributing to the process, the evaluation, improvement and effectiveness of knowledge translation remains uncertain. The potential for enhancing knowledge translation might remain unfulfilled.

While Thorpe et al. (2011) note that the KTVC does not have to start with theory development, we suggest that the linearity of the model and the positioning of theory development at KT0 reinforces rather than challenges the narrative sequence encouraged by the REF. Moreover, although the KTVC includes feedback loops for learning from later stages to inform earlier stages of the chain, it does not include processes for evaluating and developing individual interventions and knowledge within each stage.

As there is no place in the model for HRD academics and HRD research to evaluate and improve the HRD interventions used in knowledge translation, our second aim was to propose a revised model of the knowledge translation value chain for conceptualising and assessing such interdisciplinary contributions to external impact (figure 2).

The knowledge translation net

[Insert figure 2 here]

Our revised model presents knowledge translation as a number of activities, which can occur in any order. The orientations of the wording in the figure signal that it can be viewed from any direction. Reflecting our analysis of REF cases, there is no necessity for all stages to be addressed. Our model also adds processes for each activity of knowledge translation to be evaluated by people other than those undertaking the initial research, whether academics or

research users or both, so enabling their contributions to knowledge translation to be recognised. These evaluation activities are presented as arising from, or forming part, of new case studies.

Knowledge translation is thus conceptualised as a network of interrelated cases, rather than as a chain, permitting recognition of the possible roles of different disciplines and diverse users in the process. It simultaneously acknowledges that the narratives presented in individual case studies, like all narratives, have to have an internal logic 'which makes sense to the narrator' (Denzin 1989, 37). With regards to the assessment of academic contributions to research impact specifically, our model enables academics from additional disciplines contributing to the process to write their own case study narratives, following their own internal logics, and thus gain recognition for their contribution. This enables the model to represent the 'interactive network' Thorpe et al. (2011) recognise, whilst ensuring individual case narratives for the assessment of academic impact retain the 'simplicity' the KTVC chain provides.

The model also suggests that the boundaries of the narrative cases submitted to REF should be extended, as indicated by the dotted line, to include reference to evaluation arising from interaction with others, including other academic disciplines. The cases are therefore presented as a net, capturing more elements of knowledge translation. In relation to assessing interdisciplinary contributions to impact, therefore, case 1 should identify theory and evaluation from other disciplines (such as that which could form the basis of case 2a) which has enabled them to enhance their own knowledge translation activities. While this would not directly reward those other disciplines for their contribution, it would encourage the academics undertaking case 1 to seek contributions from other disciplines, which those disciplines could then write up as cases 2a-d for possible REF submission. More crucially, it would develop understanding about effective knowledge translation processes and thus enhance academic impact.

Our paper makes empirical, theoretical, practical and methodological contributions to knowledge. Empirically, it demonstrates that activities identified in the KTVC are undertaken, albeit not necessarily in the 'chain' order presented in the KTVC or fully within a single case. It also demonstrates the important interdisciplinary contribution of 'brokers' (Waerass and Nielsen 2016) such as HRD as vehicles for the delivery of impact. At a theoretical level, it presents a new 'network' model of knowledge translation that incorporates the different activities in the KTVC and retains the internal logic necessary to individual case narratives, whilst representing the interactive network necessary for effective knowledge translation. In doing so it conceptualises a new level of evaluation, not of the original research, but of the knowledge translation activities used as vehicles to achieve impact, which we argue is crucial if external impact from academic work is to be enhanced.

From a practical perspective, the paper makes clear that HEIs need mechanisms to facilitate the interdisciplinary collaboration conceptualised in our model. In particular, institutions need to facilitate collaboration with those 'broker' disciplines such as HRD, which we have shown play a crucial role in achieving impact. For the academics from those disciplines, we suggest they could turn their contribution to impact into their own cases, which could be used to gain recognition for their own impact within assessment exercises such as REF. Finally, methodologically, the paper supports claims that narrative cases have a useful role to play in the assessment of academic impact. However, we propose that they should include reference to the collaborations used to evaluate

and enhance knowledge translation activities, including those with other academic disciplines. This would encourage collaborations and research around these activities, and ultimately improve academic impact processes.

Limitations and future research

Theoretically and empirically our focus was exclusively on HRD. This provides evidence from one 'broker' discipline and offers an opportunity to consider to what extent our model explains impact and knowledge translation in other 'broker' disciplines, such as IT. We also focus on academic contributions to impact, and future research could explore the assessment of non-academic stakeholder contributions.

Methodologically, while there are perceived weaknesses of narrative case studies, they are a feature of REF and there is an opportunity for the wider range of stakeholders to learn how to narrate their interpretations of impact, given different aims and discourses.

Practically, we acknowledge the possible complexity of co-ordinating 'nets' of case studies, and of ascribing ownership of impact within those nets. We therefore stop short of recommending full co-ordination, instead suggesting that individual cases should refer to other disciplines, which might (or might not) submit their own cases, and that ownership be retained in the UOA undertaking the underpinning research. Future research could explore the mechanisms HEIs might adopt to facilitate this.

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Table 1

UOA	3 - Allied Health Professions, Dentistry, Nursing and Pharmacy		26 – Sport and Exercise Sciences, Leisure and Tourism		22 - Social Work and Social Policy		4 - Psychology, Psychiatry and Neuroscience	
Title	Workforce capacity development in the detection and prevention of elder financial abuse		Interdisciplinary Psychosocial Impacts on Coaching and Coach Education		Relational and reflective supervision for relational and reflective practice		Human Factors and Space Exploration	
	Chronological order	**HRD involved?**	**Chronological order**	**HRD involved?**	**Chronological order**	**HRD involved?**	**Chronological order**	**HRD involved?**
KT0 Theory dev.	**1**	**Yes - Development and test of training tools**	**1**	**Yes - Sport and coaching theory**	**2**	**Yes - Coaching theory from case study**	**1**	**Yes - Theory of skill development under duress**
OP1 Reporting basic research		**Academic papers. Pilot training tool**		**Academic publications**		**Academic publications**		**Academic papers**
KT1 Theory to practice thought	**2**	**Yes - Collaboration between research groups.**	**2**	**Yes - Action research**	**Not done**	**n/a**	**2**	**Yes - Advanced research workshop**

experiments								
OP2 Practitioner-oriented research outputs		**Findings informing other researchers' publications. Academic networking event**		**Practitioner-focused publications**		**n/a**		**Edited collection on current research and implication in military contexts**
KT2 Engagement of users	**3**	**Yes - Met police training tool**	**4**	**Yes - Training of individual coaches for FA; design and delivery of training for FA / UEFA**	**1**	**Yes - Evaluation of industry-level case study intervention; training events**	**3**	**Yes - Research for European Space Agency to inform European Space programme**
OP3 Outputs designed to engage practi		**Invitation for further consultation**		**Implementation of coach training**		**Practitioner testimony of enhanced supervisory practice**		**Report.**

tioners								
KT3 Widespread dissemination	**2**	**Yes - Dissemination across industry**	**3**	**Yes - Dissemination to variety of agencies; coaching manuals and involvement in coach education with variety of agencies**	**1**	**Yes - Evaluation of industry-level case study intervention; training events**	**Not done**	**n/a**
OP4 Sector reports		**Presentations; seminars**		**Existence of courses**		**Practitioner testimony of enhanced supervisory practice**		**n/a**
KT4 Services and support	**4**	**Yes - On-line training aids, podcasts, case scenarios**	**4**	**Yes - Practitioners use approach adopted to change practice**	**3**	**Yes - Informing independent consultant practice**	**Not done**	**n/a**
OP5 Directly usable		**Number of users**		**Practitioner blogs**		**Consultant testimonies of ideas informing their practice.**		**n/a**

outpu
ts

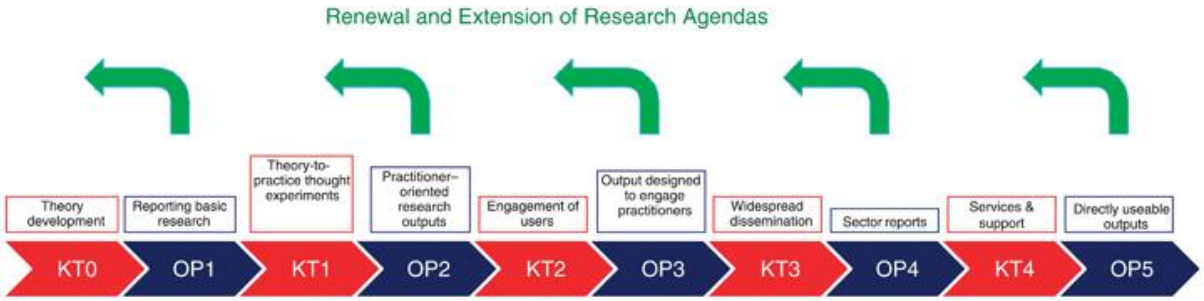
Table 2

UOA	26 - Sport and Exercise Sciences, Leisure and Tourism		22 – Social Work and Social Policy		33 – Theology and Religious Studies		4 - Psychology, Psychiatry and Neuroscience	
Title	'A tactical change'. Influencing professional development and supporting evidence-based practice within the football industry		Improving engagement with involuntary service users in social work		Religion and peacebuilding in Nepal		The first comprehensive theory-based treatment of firesetting	
	Chronological order	**HRD involved ?**	**Chronological order**	**HRD involved?**	**Chronological order**	**HRD involved?**	**Chronological order**	**HRD involved?**
KT0 Theory	**1**	**No**	**2**	**No**	**1**	**No**	**2**	**No**
OP1 Reporting basic research		**n/a**		**n/a**		**n/a**		**n/a**
KT1 Theory to practice thought experiments	**2**	**No**	**Not done**		**Not done**		**2**	**No**
OP2 Practitioner-oriented research outputs		**n/a**						

KT2 Engagement of users	**4**	**Yes – Individual development and mentoring; club-specific interventions**	**1**	**Yes – knowledge sharing seminars; research mentoring / training; induction etc. in specific organisations**	**2**	**No**	**1,3**	**Yes – Training of staff in specific organisations**
OP3 Outputs designed to engage practitioners		**Measurement of injury reductions**		**Numbers attending; existence of interventions; testimonials of impact on procedures**		**n/a**		**Measurement of improved performance**
KT3 Widespread dissemination	**3**	**Yes – Training courses. Educational materials**	**3**	**Yes – new project with additional council including reflective learning groups;**	**1,2**	**Yes – action research; participative workshop with range of stakeholders in specific regions; facilitating national level symposium**	**Not done**	

						and consultation		
OP4 Sector reports		**Numbers attending training; testimonial of impact on education**		**Changes to procedures / policies**		**Production of action plan**	**n/a**	**n/a**
KT4 Services and support	**Not done**	**No**	**1-3**	**Yes – practitioner research; practitioner-led PhD; used by educators to develop social worker professional education**	**Not done**	**No**	**4**	**Yes – Development of training manuals by others based on research; use of them by practitioners for CPD**
OP5 Directly usable outputs		**n/a**		**Testimonials of influence**		**n/a**		**Existence of manuals; testimonials.**

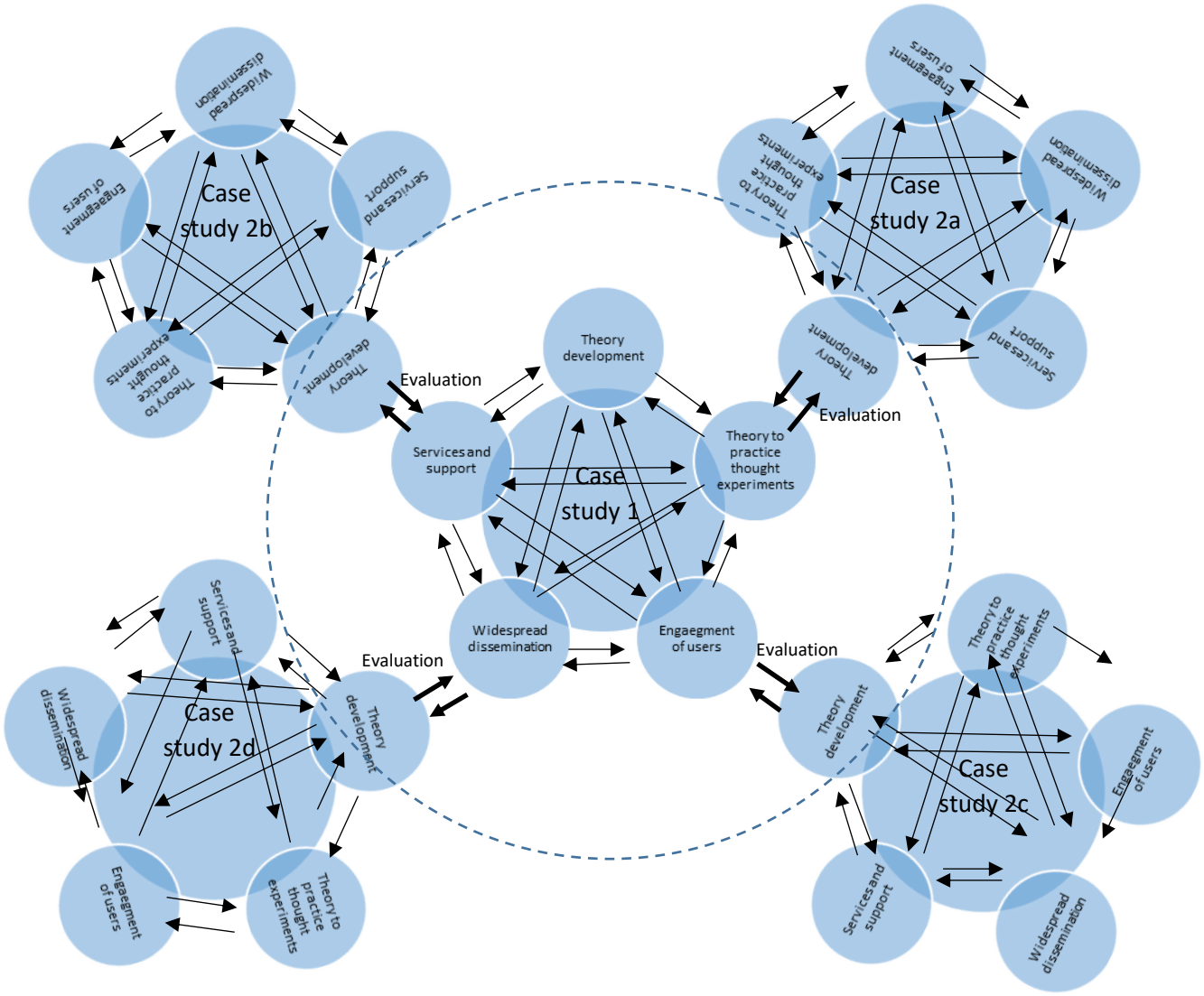
Figure 1



Key: KT = Knowledge Translation
OP = Output

(Thorpe et al, 2011, p. 425)

Figure 2


Case study 1
Theory development
Services and support
Theory to practice thought experiments
Widespread dissemination
Engaegment of users
Evaluation
Case study 2a
Case study 2b
Case study 2c
Case study 2d