Critical Systems Thinking: A post-hoc analysis of a Community OR healthcare project

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Abstract

This paper presents the findings of a post-hoc review of a Community OR healthcare project. The university-funded project's purpose was to inquire into the effectiveness of cancer support services in the southwest of England, focusing on physical activity, health, and well-being interventions for those living with cancer. Over 16-months, the project engaged cancer patients, healthcare professionals, intervention deliverers, and policy collaborators, guided by Castle's Systems methodology Circumstances, Values and Viewpoints, Activities, and Means. These system actors co-led the investigation of the interventions for cancer survivors and co-created a new referral process and Hub of Practice for cancer support services. They intended to double the cancer referral rate from its baseline of 10%. While there were notable successes, the system analysis by the actors proved challenging to facilitate, so to the operationalisation of the Hub of Practice. At different points during the methodology deployment, the workshop sessions stalled as the actors could not offer contributions to advance the interventions needing the facilitator and project team to backfill. We also found activities missing when attempting to operationalise the Hub of Practice. These deficiencies prompted the facilitator and the project team to action a post-hoc analysis of the project drawing on Ulrich's Critical Systems Heuristics. The outcomes of the post-hoc review may be helpful to other systems researchers engaging in Community OR health projects.

Keywords: boundary judgements, Community Operational Research, critical systems thinking, healthcare, interventions, methodology, physical activity, and system actors.

Introduction

The Community Operational Research healthcare project of interest was the inquiry into the effectiveness of cancer support services in the southwest of England (Fusion, BU, 2015). Community Operational Research, Community OR for short, in the context of this project, was the opportunity to engage those living with cancer to help improve their access to physical activity, shortened to PA, to enhance their well-being and quality of life. Midgley (2000, p.279) defines Community OR as "*an intervention in the service of community development: working for improvements by dealing with issues that have a perceived negative effect on either the whole of, or sections of, local communities*". So, the purpose of the university-funded project was twofold. Firstly, investigate the effectiveness of the physical activity, health, and well-being interventions for those living with cancer in the geographic area of interest. Secondly, to help make a case for a hub of practice for such interventions. Achieving the purposes and fulfilling the project's objectives meant collaborating with other agencies, such as specialist cancer charities, intervention deliverers, and Living Well and Active (LWA). LWA is an organisation that recognised the need to co-ordinate the link between cancer patients and PA providers by liaising with community healthcare services, hospitals, and GP surgeries. Thus,

LWA became the key partner of the project and assisted in identifying individuals and organisations to inform the project's investigation.

Policy context

The motivation to undertake the project came about because of the switch in public healthcare and sports policies to include PA promotion. The catalyst document was the Chief Medical Officer's Guidelines (CMO, 2011) and his determination to tackle the 28% of the UK population considered inactive because of the public health implications of such high levels of inactivity. *Moving More, Living More* (HMG, 2014) references the Chief Medical Officer's concerns when espousing the benefits of PA to avoid the costs of not tackling inactivity to the individual and society. The road map that is intended specifically address his concerns and the then government's public healthcare policies is the document *Everybody Active, Everyday* (PHE, 2014) and its healthcare objectives of an active society, moving professionals, active environments, and moving at scale.

Everybody Active Everyday objectives cascaded down for sport in the document *Sporting Future: A New Strategy for an Active Nation* (HMG, 2015), which set out the sports and PA policy framework for sports organisations in the UK. Sport England, the government, funded quango to lead sport at the introduction, participation, and performance levels (Hylton et al. 2001, pp.5-6) responded with its document *Towards an Active Nation* (SE, 2016). *Towards an Active Nation* indicated specific initiatives to encourage people to become more active through sport and PA and target groups, such as inactive children. *Towards an Active Nation* also included initiatives for those living with long-term illnesses, such as cancer, diabetes, heart conditions, mental health problems, and obesity. *Everybody Active, Everyday* (PHE, 2014) highlights several long-term illnesses, such as cancer, as part of the raft of public healthcare changes it calls for, which certainly overspilled into the document *Cancer Healthcare for the Future* (NHS, 2015). *Cancer Healthcare for the Future* promoted the cancer survivorship agenda to support people living with cancer, to manage their condition, health, and well-being. The purpose of the document *A Five Year Forward View* (NHS, 2016) was to address the perceived gaps in supporting patient needs along the cancer care pathway. The document emphasises the survivorship agenda and greater involvement of the Third Sector, so patients self-manage their follow-up pathway and move away from too many routine and unnecessary hospital appointments. Thus, *A Five Year Forward View* focuses on upskilling survivors with the necessary knowledge to conclude their treatment and live beyond cancer, including lifestyle-based secondary preventions, including PA.

Against this backdrop of vastly changing policy frameworks for public healthcare and sport stimulated the research team's desire to inquire into the effectiveness of the PA interventions for those living with a long-term illness, such as cancer. After all, physical activity, health, and well-being promotion has been front and centre of public healthcare and sports agendas for 4-years and almost as if such promotions will be the new panacea for society's ills. Focusing on PA interventions for those living with cancer meant we were able to define the boundary for the system of interest, as follows:

> (A system to co-ordinate) the design and delivery of physical activity interventions for cancer patients in the geographical area of interest. This is perceived as a subsystem of the Health Service's lifestyle-based secondary preventions system.

To inquire into the effectiveness of the PA interventions for those living with cancer meant engaging with healthcare professionals, healthcare and sports policy people, intervention

deliverers, and patients. Because of the perceived need to collect quantitative and qualitative data from cancer patients, healthcare professionals, intervention deliverers, and policy people, the team needed to devise a methodology that would address the objective, subjective and radical paradigms of practical thought about the life flux of individuals and organisations within the sphere of PA. The CVAM approach (Castle, 1998b) appeared to lend itself to the purpose of this inquiry. However, in its original form, it lacks a critical systemic perspective. It was decided, therefore, to build a fuller, more workable model incorporating the dimensions suggested in CVAM. This is depicted in Figure 1 (A fuller discussion of the authors' thinking in developing this model will be explored in a later paper). So, we recognised that individuals and organisations need to systemically inquire about the CVAM imperatives embedded in each paradigm to trigger improvement action and restore their life balance. Here, the lack of access to PA interventions is a disturbance as it denies cancer patients the opportunity to engage in PA to advance their normalisation journey. At roughly the same point we selected CVAM, an application for university funding was successful; thus, the 16-month project launched in late 2015. During this period, the above System's actors contributed to the investigation through patient questionnaires, interviews and workshops with healthcare professionals, patients, policy people and intervention deliverers, as guided by CVAM (Castle, 1998b).

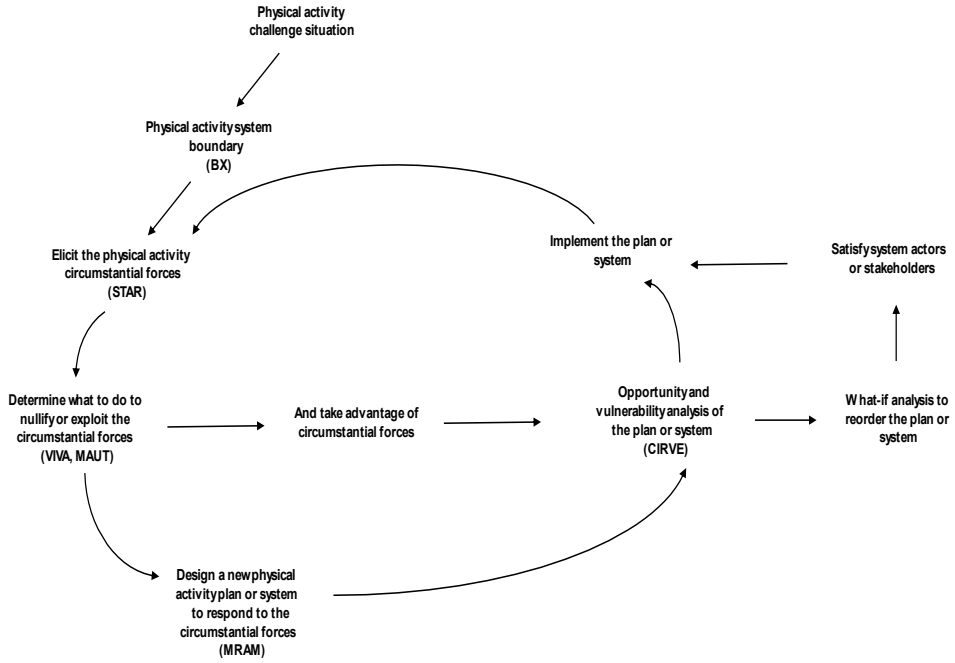

Fig 1, An overview of CVAM for cancer patients physical activity

Systemic discoveries and moving towards interventions improvement

The use of CVAM (Castle, 1998b) in Mode 2, the full deployment of CVAM and its methods, proved successful and generated a vast amount of data for the System's actors to attenuate, validate, and guide interventions improvements. The operationalisation of CVAM starts with the inquiry into the *circumstantial forces*, the external factors impacting the opportunity situation. Then the *values and viewpoints* of the opportunity and what system actors feel to

respond to the circumstantial forces. Followed by CVAM's *activities* or the systems the actors design or redesign to tackle the circumstantial forces. Lastly, CVAM's *means* or the resources necessary to operationalise the activities to capitalise or nullify the circumstantial forces to complete the processes required for system improvement. Using CVAM is guided by its Process Framework, which is Table 1 illustrates.

Table 1, the CVAM Process Framework

Three fluxes	Disturbance (unplanned?)	Systemic Discovery	Attenuation	Validation	Analysis	Improvement Action
Objective	A1	B1	C1	D1	E1	F1
Subjective	A2	B2	C2	D2	E2	F2
Strategic	A3	B3	C3	D3	E3	F3

Source: Adapted from Castle 1998b, p.107

The y-axis presents the three paradigms. These address objective, subjective and strategic/radical concerns of the opportunity situation as fluxes across time. The x-axis summarises the CVAM processes as a sequence of five formal steps, which may require systemic loops or returns to earlier stages depending on findings of the systemic intervention. These are labelled B-F, and the three fluxes 1-3, in the Table. As the CVAM process moves from *disturbance* to *improvement activities*, users' variety engaged by the complexity of the opportunity situation progressively attenuates. Castle cites the work of Ashby (1956) to stress that for any methodology to be able to address complexity, it must deploy equal variety. Castle further cites Ashby (1956), who argued that all such systemic capture requires attenuation or distilling down if practical users engage it.

CVAM's methods

For the *disturbance* stages A-B, users are guided by CVAM-BX, the boundary exploration method, to define the system boundary and actors to engage in advancing an intervention. The CVAM-STAR method guides *systemic discovery* at stages B-C to elicit the circumstantial forces causing a disturbance to an individual's or organisation's life. Then, to capture viewpoints from actors to tackle the circumstantial forces. System actors also use the Multiple Attribute Utility Technique (MAUT) to *attenuate* and prioritise their viewpoints to exploit or nullify the circumstantial forces. The attenuation mechanism here is a dedicated procedure crucial to successful attenuation. Castle stresses to users that the CVAM attenuation procedure allows the identification of hard categories, subjective themes, and power fluxes unique to the opportunity situation.

At the *validation* stage, C-D requires the validation of the attenuated data of B-C, which are the emergent plans proposed in response to the opportunity situation. Castle deems validation is necessary to prevent completely impractical plans emerging from the attenuation procedures. The CVAM-VIVA method is the validation process that produces value trees, like the attenuated maps of viewpoints, particularly at stage C2. The heuristic procedures for validation enable teams to reflect on their emergent plans to avoid gross errors. Castle cites Beer (1979, p.199), who has typified this response as an 'inside and now' trap. By contrast, the challenge situation often demands an 'outside and then' strategy. As Castle also indicates, this stage of the work is informed by considering Ulrich (1993), who argued for social validation by engaging the views of those affected.

Incorporating a social validation stage enables users to address these ideas using CVAM-VIVA, especially at positions D2 and D3. Castle then confirms that objective models may examine capability, capacity, or flexibility issues at E1. At E1 strategic and marketing analysis, users may also employ around the critical issues of the emergent plans. However, the subjective analysis continues conceptualising means and modelling crucial processes as chains of activities at E2. Castle finally points to strategic analysis at E3 that pulls together the hard and soft data to explore synergy and power relations patterns. The resolution of the strategic validation enables actors to draw many conclusions regarding reordering relationships within the strategic flux. Thus, the *analysis* stage, D-E, CVAM-MRAM directs the mapped resolution of activities and means essential to operationalising the systems to address the circumstantial forces and relevant improvement activities. So, this, together with the hard goals and subjective validation, enables the formulation of *improvement action* at stage F. At stages E-F, CVAM-CIRVE also guides improvement action via opportunity and vulnerability assessment of the new systems to exploit or nullify the circumstantial forces. CVAM-CIRVE introduces the time dimension by testing the sensitivity of the systems to future scenarios. Overall, CVAM offers a five-step framework to direct systemic inquiry into the paradigms of practical thought and provides five methods to guide such an inquiry. Systemists can use CVAM in Modes 1, 2 or 3, and a single paradigm can be the focus of an inquiry, providing the user acknowledges the deceptions of such an approach.

Systemic data capture

Here, the actual deployment of CVAM and to initiate the 16-month project, semi-structured interviews were conducted with system actors to capture data on the circumstantial forces and the organisation of PA interventions for those living with cancer in southwest England. Such a start of the project is consistent with other Community OR projects, such as those described by Midgley (2000). The interviews lasted 6-months, with each discussion an average of 60-minutes, and guided by a carefully designed PA interview schedule. We also ensured the schedule enabled us to inquire into CVAM's activities, such as the organisation and effectiveness of interventions. CVAM's means include resources to support the cancer pathway and co-ordinate cancer support services across the geographic area of interest. Simultaneously to the interviews, we collected data from a large sample of LWA's cancer patients using a Patient Activation Measure (PAM) (Hibbard et al. 2014) questionnaire. PAMs captured data on attributes, such as background, type of cancer, what stage of treatment, how or if referred to the cancer pathway, kind of physical activity, health, and well-being intervention, and how they were getting on with their intervention. Their level of satisfaction with their intervention as well. Here, invaluable that patients with different cancer conditions contributed to the dataset to measure the effectiveness of interventions.

The interviews and questionnaires proved successful, generated multiple verbalisations to assess the effectiveness of cancer support services, and produced a data-rich backdrop for the CVAM workshops. Table 1 reports the System's actors' verbalisations, including short descriptors to ease reporting of each insight, with the highest priority from the 7-month data collection period presented in the Table.

Analysis

As an overview of the System's actors' verbalisations, it is not uncommon when actors consider improvement the imperative for there to be a *values and viewpoints* dominance. Castle (1998b) calls for identifying the CVAM dominance because it profoundly affects the system design or redesign. There is a values and viewpoints dominance in the dataset as the actors reveal best practices and areas for improvement.

Circumstantial forces	*Values and viewpoints*	*Activities*	*Means*
○ Society's awareness about cancer and people's openness to talk about their illness ○ NHS continuing healthcare policy changes ○ UK's ageing and physically inactive population ○ Government's intention to switch healthcare services into the community ○ Populations changing awareness about the importance of physical activity, health, and well-being ○ Changing attitudes of healthcare professionals ○ Switch resources to support the survivorship agenda rather than palliative care ○ Increasing occurrences of cancer in society	○ Survivors not understanding interventions or service offers ○ Services reach and need more choices ○ Healthcare professionals interacting with patients need to understand offers ○ Concern whether healthcare professionals were referring patients ○ Survivorship agenda and third sector involvement with services ○ More services into the community as opposed to the clinical setting ○ The effectiveness of LWA's leadership and services delivery is highly respected ○ LWA engaged and connected people and brought organisations with the same objectives together ○ Partners had longstanding relations with LWA ○ LWA's resourcing of the partnership and how it recruited other deliverers to the pathway ○ Reconfiguration of services need new governance, leadership, and relationships ○ Other than LWA, the referral process fragmented and hit and miss ○ Training of healthcare professionals on the importance of patients' ownership of their illness and health	○ Physical activity, health, and well-being interventions ○ 6 to 12-week programmes, with opportunities to extend engagement ○ Importance of processes that describe rather than prescribe activities ○ Co-design processes to achieve high adherence levels ○ Deliverers established a track record of offering interventions ○ Patient engagement systems to understand their needs ○ Alternative programme logic to policies, especially health and well-being interventions ○ LWA's network of deliverers and processes to recruit deliverers ○ Embedding of mindfulness and well-being less well developed ○ Design of a new hub of practice and referral process	○ Increasing reach, scaling-up flagged as a concern ○ Focusing and supporting the patient is the critical success factor ○ Changing NHS funding and changing healthcare priorities ○ Resources to keep the physical activity, health and well-being momentum going ○ Cessation of delivery if LWA disappeared because of cuts ○ Healthcare professionals cannot be experts in all areas of delivery ○ Service fatigue caused by changing NHS goals and targets ○ The danger of LWA becoming detached if too large ○ Expansion of interventions into other long-term illnesses, such as diabetes and obesity ○ Healthcare service confusion because of physical activity, health, and well-being information overload.

Table 1, the prioritised verbalisations of the system's actors

Their values and viewpoints were populated mainly by verbalisations on how to increase access to cancer support services and the range of interventions potentially available to cancer patients. They seem to call for greater emphasis on the patient and better information on the interventions available to patients. They did acknowledge the effectiveness of LWA at promoting interventions and generally leading the delivery of cancer support services across the territory of interest. Their consensus was that LWA should be the basis for a new hub of practice for the territory's PA interventions.

Their insights on the *activitie*s confirmed a range of established interventions potentially available to patients and the success of many deliverers offering the interventions. They stressed the need to co-design interventions with patients to satisfy their normalisation needs more effectively and for health and well-being interventions, in addition to PA. They pointed to the need for a deeper understanding of the survivor journey and embedding mindfulness in the programme logic of interventions. Thus, their activities seem to applaud the quality of existing interventions and the delivery of interventions, but an opportunity to dramatically expand offers to other survivors in the project's area. Surprisingly, their verbalisations against the *means* seemed more concerned if LWA no longer existed or how to resolve the conflicting resources demands of contemporary healthcare provision. So, actors were not necessarily calling for more resources for activities. Instead, they argued protecting that available and expanding into other long-term illnesses, such as diabetes, obesity, and mental health.

A further surprise was how much actors understood the implications of the *circumstantial forces* impacting the System's boundary (p.2), particularly the healthcare policy changes and the switch of focus onto the survivorship agenda. The boundary we firstly defined drawing on the healthcare policy documents and secondly, when deploying CVAM-BX with LWA, the lead organisation for cancer referrals at the time of the project and collaborating organisation. Actors viewed such healthcare policy changes as the most significant challenge to any new cancer referral process because of the uncertainty caused by the changes. The low number of cancer patients engaging with the project's territory interventions was a telling statistic. Of the approximate 5,000 cancer survivors, less than 500 had engaged the cancer pathway operationalised by LWA to help them normalise after their cancer diagnosis and treatment. Thus, there was only a 1:10 chance they would be referred to the cancer pathway to assist with their rehabilitation. Overall, the actors structured a situation of missed opportunity resulting in poor circularity for cancer support services across the territory of interest. Drawing on the work of Ulrich (1986), he offered a toolset of 12-heuristic questions to help inquirers form judgements about boundaries of their systems of interest. These are divided into questions about perceptions of the current system (What 'Is') and perceptions of what an ideal system should be (What 'OUGHT'). Our interpretation of the challenge situation informed by Ulrich's thinking proved that the IS system was fragmented and reactive instead of connected and proactive.

The IS system

The *clients* of the IS system should be those living with cancer across the area of interest likely to benefit from PA interventions to help progress their normalisation journey. However, because of the disconnect across the IS system, too few enjoy the cancer support services provided by LWA. A further client of the IS system is the Healthcare Service because they should be working with organisations to support patients after their hospital treatment. The *purpose* of the IS system should be to provide PA interventions for cancer survivors to assist their rehabilitation in improving their quality of life. PA interventions should be for all cancer illnesses and patients living with Stage 1, 2, or 3 cancer conditions, who are likely to recover.

The IS system should *measure its success* by a higher referral rate than 10% of cancer patients eligible for the PA interventions, plus the number of patients achieving quality of life post-treatment. PA Providers should also report patient participation to compare against LWA plans to increase the number of IS systems referrals. LWA is the *decision taker* collaborating with two hospitals, yet many more exist in the IS system and only a handful of the forty-plus GP surgeries in the territory. So, LWA, by default, is the decision-maker for the IS system, which means LWA is the decision taker for those who should be involved in the IS system. All hospitals, surgeries, community healthcare, and PA providers would be involved in the system if the *conditions* were to change, even though *sixty-four* delivery partners were engaging with LWA.

At the *environment* level, the decision on funding sits with the County Commissioning Groups (CCGs) and Public Health (PH) agencies and those potentially able to provide additional funding to support but not connected to the IS system. As it stands, LWA is also the *planner* by co-ordinating PA provision across the conurbation of interest and has a Strategic Working Group (SWG) of healthcare professionals, providers, and local government people to advise on delivery, such as the design of interventions. The SWG is the *expert* group that shapes LWA's policy, and the SWG *guarantees* the success of the IS system. Thus, the 10% who are fortunate to engage in the cancer referral process receive excellent services from LWA, as rated by them. In addition, patients have representation on the SWG, so they hear the *witness's voice*. LWA further organises discovery days, which are mini-conferences. All cancer patients can attend free of charge, and it is their *emancipation* opportunity with other patients and the panel, including SWG members. Thus, the *worldview* underlying the IS system is LWA's, with the sole purpose of helping those living with cancer to normalise to improve their quality of life after their life-changing experience. However, to uplift the referral rate to more than 10% needs something different.

The OUGHT system

The actors' solution to this situation and OUGHT system, again, drawing on the work of Ulrich (1986), is their co-designed referral process and Hub of Practice, shortened to Hub. Their referral process connects acute, primary, secondary, and community healthcare services. The Hub is their one-stop solution for all enquiries relating to PA interventions for those living with cancer in the conurbation. They reiterated that the Hub is the operations of LWA, plus new strategic elements, such as connecting with the CCGs and PH. Fig 2 is the OUGHT system as a Map of Functional Relationships. Each ellipse is a system in its own right designed by actors in the CVAM workshop document *Mapped Resolutions, Activities and Means* (MRAM) (Castle, 1998b). The *clients* of the improved OUGHT system are the conurbations, cancer patients. Because of the new referral process and Hub, the areas acute, primary, secondary, and community healthcare services. The OUGHT system's *purpose* is to provide PA interventions to almost all of the area's 5,000 cancer patients because of the new joined-up approach to how the referral process offers interventions to patients. How the referral process connects to the Health System should reach 90% of patients, the 10% being the self-referring patients. The OUGHT system will *measure success* via the referral rate, increase to 20% of eligible patients, and report patients who achieve an enhanced quality of life. PA providers will improve their monitoring and control of patients who engage with their interventions.

The system's *decision taker* will be the Hub because of its new strategic leadership role and coordination of interventions across the conurbation. Its collaboration with strategic healthcare groups, such as CCGs and PH, will enhance its leadership. The critical *components* to be controlled by the Hub actors illustrate in Fig 2, with additional conditions and resources of the

environment via the CCGs and PH as strategic partners. These, along with the Hub, operational healthcare professionals, PA providers and health consultants, are *designers* of the improving OUGHT system. The *expertise* continues with the SWG; however, actors call for better representation of healthcare professionals and cancer patients. The Hub and its SWG will be the *guarantors* of the system, with better patient data. Actors call for more cancer patients to sit on the SWG as *witnesses* of PA design and delivery and the *emancipatory* opportunity to continue via the discovery days for cancer patients. So, the *worldview* changes from LWA's to the Hub's and intends to provide PA interventions to more cancer patients across the conurbation. The systemic work with the actors was not without its difficulties, however.

Reflections on the process of inquiry

The System's actors viewed the Hub and the referral process as the right improvements to uplift the number of cancer patients who would benefit from the LWA cancer pathway. Connecting acute cancer care, primary and secondary, and community services to the Hub provides a joined-up approach to cancer support services. To this point, LWA was only receiving referrals from acute cancer care providers; thus, including primary and secondary, and community services dramatically increased the likelihood of higher numbers of cancer patients engaging with the pathway. In addition, the Hub's role of recruiting and quality-assuring deliverers, plus generating evidence based on the impacts of PA interventions, is a more attractive proposition to the territory CCGs. They are potential funders of a proven solution. Undoubtedly, the attractiveness of the Hub, referral process and other findings of the project informed a successful Active Ageing bid and continuation into men's cancer services provision. The whole system approach also attracted interest from research societies, such as the Sichuan Academy of Social Sciences (Evans et al. 2018) and an invitation to write a book on cancer support services for the international market. So, the project's findings resonated with both academic and practitioner groups.

Theoretical analysis

We were intrigued by the actors' conceptualisation of the Hub and undertook a comparative theoretical analysis. Here, the Hub as a Centre of Excellence provides strategic leadership of the system, governance, new partner organisations, Health System networking, policy advice, funding and broker service, and relationship management. For the interventions for survivors, health and well-being guidance, PA interventions design and review, coordination of offers and interventions, mindfulness support, advice of normalisation strategies, and the quality assurance of deliverers. The provision of information services to patients and stakeholders, including one-stop solutions, events and conferences, discovery days, carers and healthcare professionals training, digital resources and webpage maintenance. Interestingly, Galvez et al. (2019) argue the importance of a Centre of Excellence to promote children's health in a built-up conurbation. Elrod et al. (2017), for the delivery of specialised healthcare programmes, capitalising on the delivery model and its benefits. However, Elrod et al. also point to a lack of knowledge on how to assemble a Centre of Excellence.

Al Khalifa et al. (2018) contest the health benefits of a Centre of Excellence, although more for quality of life, food tolerance and eating disorder behaviour, and Matthews et al. (2018) to identify ways of controlling medical costs in hospitals and their procurement procedures. The need for knowledge development and sharing is an argument put forward by Adenfelt et al. (2006) for a Centre of Excellence and Anagnoste (2018) to inform process automation and tackle low added-value work in organisations.

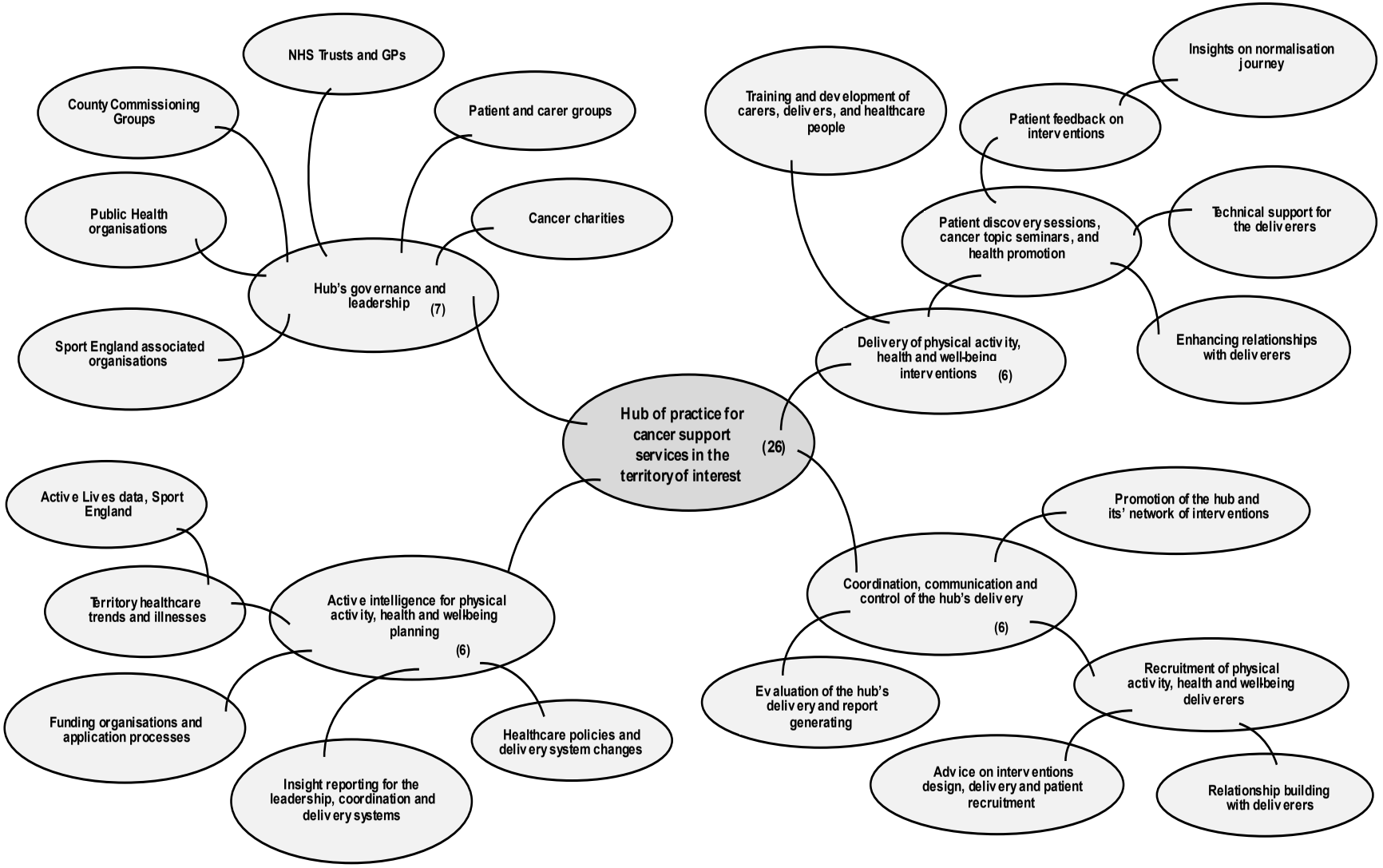

Fig 2, Map of Functional Relationships

Continuing the theme of processes, Dimipoulou et al. (2018) assert a Centre of Excellence to guide the introduction of total quality management and business excellence in sports organisations. For O'Leary et al. (2008), to promote excellence in project and programme management. Walker et al. (2005) also call for a Centre of Excellence to encourage knowledge, wisdom, and networks for effective project management, an earlier proposal by Anderson et al. (2000) and their call for network embeddedness in larger organisations. The Hub model co-produced by the system's actors does appear consistent with each of these centre of excellence positions.

The comparative analysis of the actors' model against Hub literature was weaker because of a lack of sources. However, the actors' model still proved consistent with the two best conceptualisations showcased by Jeyasingham (2017) and Berger et al. (2017). Jeyasingham (2017) calls for multiagency safeguarding Hubs to provide the right environment for families, social services, and police to manage the safety and welfare of children, and Berger et al. (2017) for the setting-up of Hubs to drive the product and service innovations of organisations. LWA's positive experiences of multiagency working influenced the actors' design of their new Hub. They also recognised LWA's effectiveness in maintaining relationships with collaborators, deliverers, service-us, and LWA's many service innovations, e.g., cancer patient discovery days, which should all be part of their Hub. However, while the project findings and comparative analysis results were favourable, implementing the Hub and referral process was far from satisfactory and started to raise fallacious concerns.

Regarding the Hub, the CVAM workshop sessions did not address the cultural barriers in healthcare organisations and almost negative perceptions of the benefit of PA interventions without empirical evidence. In addition, the independent governance structures of healthcare organisations, such as GP surgeries, means they are likely to prioritise their objectives at the expense of the Hub. A related point here is leadership and its ambiguity and confusion. It proved challenging to determine where the leadership function was, who the ultimate decision-maker is and whether healthcare organisations allow the Hub to assume such a role as PA leader for those living with cancer. Finally, a more disturbing omission from the CVAM workshop sessions was how exhausted the Healthcare System is. There was also too much resource stretch and overreliance on charities.

The omissions of the referral process were alarming. For the GP consultation process to work and allow for an interventions discussion with patients, a strict healthcare policy of twenty minutes per patient is in place and funded. To go beyond this requires more time and money. The healthcare professionals' PA knowledge were variable and contingent on whether the professional is interested in PA. Information overload was an issue on PA opportunities within each community without any checks on the quality of such interventions. There also seemed to be a preference to refer patients to what existed than asking what they preferred to do. At best, then a rudimentary understanding of the patient experience and compounded by the limitations of the predetermined questionnaire. These oversights were sufficient to prompt us to rethink the approach to the project and revisit some of the fundamental decisions around the methodology, whom we engaged with and how we engaged the people. From our field research diary notes, we were aware that the workshop sessions did stall because no contributions were forthcoming from some of the actors and required us to backfill the data capture to help complete some of the modellings. We opted for a post-hoc analysis of the project for these reasons, even though the usual project reviews and end of project reports were approved.

Post-hoc analysis of the Community OR project

In opting for a post-hoc analysis of the project, we returned to Ulrich's (1986) 12-critically heuristic boundary IS and OUGHT questions to inform our analysis. By auditing the project against Ulrich's questions, we hoped to identify where there might have been a shortfall with our CVAM (Castle, 1998b) systemic intervention. Therefore, the Principal Investigator (PI), Co-investigator (CI) and the Managing Director of LWA undertook the project's audit drawing on all intervention documentation. Table 2 reports the outcomes of the IS audit, and Table 3 the outcomes for the OUGHT audit.

Table 2, the outcomes of the IS system audit

The twelve IS questions	*Audit findings*
Who is the *client* of the system design?	Cancer patients in the conurbation evidenced by LWA
What is the actual *purpose* of the system design?	To provide PA interventions for cancer patients
What, judged by the design's consequences, is the built-in *measure of success*?	The referral rate; however, only 10% of those eligible were accessing PA interventions
Who is the *decision taker*?	LWA for the interventions under its control and the patient reach it can achieve
What *conditions* of successful planning and implementation of the system are controlled by the decision taker?	LWA was working with two hospitals and a handful of GP surgeries, but not all in the territory of interest
What conditions are not controlled by the decision taker, i.e., what represents the *environment* to him?	Healthcare policies and pathways of Public Health and the County Commissioning Groups
Whose involvement as a *planner*?	LWA and supported by stakeholders from across the territory, e.g., deliverers and healthcare professionals
Whose involvement as an *expert*?	The Strategic Working Group (SWG) who advise LWA on the design and delivery of PA interventions
Where do the involved see the *guarantee* that their planning will be successful?	The LWA Board and via liaising with the territory's sixty-four PA interventions deliverers
Who among the involved *witnesses* represents the concerns of the affected?	Cancer patients sit on the SWG and help to advise of the design and delivery of PA interventions
Are the affected given the opportunity to *emancipate* themselves from the experts and take fate into their own hands?	The discovery days enable cancer patients to determine what they would like to engage with, in addition to the LWA PA interventions
What *worldview* is underlying the design of the system?	LWA and their determination to support cancer patients' normalisation journey via PA interventions.

Source: Adapted from Ulrich 1986

We evidenced responses to the IS questions from the interviews and the CVAM workshops, especially BX, STAR and VIVA. We also recognised that despite LWA's perceived need to support cancer patients, they sat outside mainstream healthcare policy. Its focus was more on the design and delivery of PA interventions, so more operational than strategic. LWA needs to connect to healthcare policy organisations, such as the CCGs, to directly or indirectly support its work.

We found evidence here mainly from the CVAM MRAM and CIRVE workshops. It became clear that the modelling deficiency occurred under the OUGHT question: *what kind of expertise ought to flow into the system's design?* While actors offered contributions to uplift the referral process, they struggled to specify what strategic functions the Hub should do, building on the successes of LWA. It seemed they lacked the knowledge to project the new entity fully. We attribute this to their occupational backgrounds, particularly the healthcare professionals whose strategic appreciation was not as strong as they believed.

Table 3, the outcomes of the OUGHT system audit

The twelve OUGHT questions	*Audit findings*
Who ought to be the *client* (beneficiary) of the system to be improved?	Cancer patients in the conurbation; however, to reach many more of them
What ought to be the *purpose* of the system design?	Continue to provide PA interventions for cancer patients to support their normalisation journey
What ought to be the system's *measure of success*?	Doubling the referral rate to 20% and report the number of patients who achieve a quality of life
Who ought to be the *decision taker*?	Hub of practice instead of LWA, with a more significant stakeholders' input
What *system components (resources and constraints)* should the decision taker control?	Cancer patient referral process for the whole of the territory of interest
What resources and conditions ought to be part of the system's *environment*?	Connected to Public Health and the County Commissioning Groups to access all acute, primary, secondary, and community care services
Who ought to be the *designers* of the system?	Hub of practice as a multi-partnership of consultants, deliverers, healthcare professionals, and local authority people
What kind of expertise ought to flow into the design of the system?	*System actors of the project when designing the Hub of practice and referral process. Otherwise, advisory committees supporting the Hub*
Who ought to be the *guarantor* of the system?	Hub and its governance structures and processes
Who ought to belong to the *witnesses* representing citizens' concerns that will or might be affected by the system's design?	Cancer patients sitting on the Hub's board and the advisory committees
To what degree should we offer the affected the chance of *emancipation* and how?	Continue as the discovery days to enable patients to determine what they engage with, in addition to the Hub's PA interventions
Upon what *worldviews* of the involved or the affected should we base the system's design?	Hub supports all territory cancer patients on their normalisation journey and quality of life.

Source: Adapted from Ulrich 1986

The Hub is a unique output of the project and critical to ensuring the effective operation of the actors' multi-strand cancer referral process. As a Centre of Excellence, an entity of best practice, the Hub intends to provide the technical support for the referral process and those delivering or about to deliver PA interventions to patients. It will advise how to design interventions, review interventions, and quality assure new PA deliverers. The Hub will create the evidence base of PA interventions to show how patients achieve a quality of life post their cancer trauma. The Hub's knowledge system will also provide evidence to support funding bids and be the point of contact for healthcare professionals with PA queries. The training and development of carers deliverers and healthcare professionals, plus create and share the evidence to show what interventions work best for what types of cancers, such as breast cancer. It intends to create a database of patient case studies and deliver specialist PA seminars and workshops. In addition, the Hub could conduct research for charities, such as Macmillan and Cancer Care UK.

CVAM (Castle, 1998b) achieved the goal of guiding the inquiry, albeit challenging at different intervention points. It was always our intention that the staff of LWA would lead the CVAM workshop sessions as the analysts, with us facilitating the sessions when necessary. However, even after their CVAM training sessions, we had to step in and lead some sessions, particularly MRAM and CIRVE. Reflecting on STAR, though, actors found the need to evidence their circumstantial forces awkward but generated many library cards on what needs to improve the system. Also, the maths associated with MAUT to order and prioritise their circumstantial forces proved taxing for some actors, with one group almost abandoning the method as they

felt it overkill. The systems modelling of activities and means proved the most challenging workshop we led. It also took several iterations to design models that would exploit or nullify the circumstantial forces. The probability calculations for the opportunity and vulnerability projections of CIRVE were, again, taxing. Otherwise, wherever possible and as suggested by Midgley (2000), we used plain English as the language of Systems can be downright confusing. So, we substituted terms to describe what they were doing in each session. However, the actors' feedback on their intervention was positive. Some indicated how much they had learned, especially the system design and creation of the Hub and referral process.

Discussion

The decision to employ CVAM (Castle, 1998b) was because we needed a methodology to guide the project's inquiry of the objective, subjective and strategic radical paradigms of practical thought. CVAM offers methods to guide inquiry at each step of the CVAM process, including a method for boundary exploration, CVAM-BX, to reveal the system boundary of interest and which system actors should be involved to advance a systemic intervention. The Principal Investigator has extensive experience using CVAM in twenty different projects and always found the BX method reliable. Here, in effect, the System's boundary is mapped because we were inquiring into lifestyle-based secondary preventions (The Cancer Taskforce, 2015) for those with a long-term health condition. Specifically, PA interventions for those living with cancer in the Southwest of England. Therefore, we view the design and delivery of the PA interventions as the System and a subsystem of the Health Service's lifestyle-based secondary preventions system (The Cancer Taskforce, 2015).

The key agency in the PA system is LWA. By collaborating with them, we elicited the primary and secondary boundary elements, plus what Midgley (2000, pp.143-146) refers to as the marginalised elements. After completing the boundary mapping exercise, the view of LWA and us was the potential for conflict arising from the marginalised elements. We understood the primary boundary as the PA system for those living with cancer. LWA purposefully sampled from its network to assemble a frame of system actors to advance the project, such as cancer patients, physical activity deliverers and healthcare professionals. However, the recruitment of others was not an initial consideration to inform the project and hence, the secondary boundary. Within this boundary was the marginalised elements of other patients, deliverers and professionals who probably had viewpoints on improving the existing system's referral process but not in LWA's network. We recognised that the patients and healthcare professionals were sacred (Douglass, 1966) (cited in Midgley, 2000, p.143) and the profane deliverers who could potentially help improve the referral process. Midgley borrows the terms sacred and profane when arguing the existence of an intervention's secondary boundary and its marginalised elements. The elements can lead to conflict, so acknowledging the status of the sacred and profane guides which boundary should be the focus of decision-making. We eventually reached out to some of the sacred and profane that meant the secondary boundary was the focus and reinforcing decision-making, which enhanced the project's triangulation (Silverman, 2021), further reducing the risk of boundary conflict. Expanding to the secondary boundary meant cancer patients and healthcare professionals were allowed to express their viewpoints to improve and challenge those with the power and control over the system.

With such diverse viewpoints, highly informative interviews revealed the fragmented state of the existing referral process when reflecting on Ulrich's (1986) twelve what IS questions. We supplemented the interviews data with PAM's (Hibbard et al. 2014) questionnaire data that helped to confirm what was working well and what was not working so well with the existing

referral process. So, cancer patients of the primary and secondary boundaries either participated in the interviews, completed a PAM's questionnaire, or both, with all results shared with the project's actors. The CVAM guided systemic inquiry responded to the quantitative data of the PAM's questionnaire and the qualitative data of the interviews as the system actors completed the CVAM methods of STAR, VIVA, MRAM, and CIRVE (Castle, 1998b). These workshops stimulated much debate as deliverers, patients and professionals moved to co-produce a new joined-up cancer referral process and Hub and what should be the case reflecting on Ulrich's (1983) twelve OUGHT questions visualised in Fig.1, p.10. The MRAM workshop was incredibly engaging as the actors co-produced and visualised their cancer referral process and Hub models and certainly provided the opportunity to take stock of their thinking visually. Bryson et al. (2004, pp.127-145) point to the power of visual thinking to lead to further improvements as participants verbally test, modify, and validate their models. CVAM-MRAM was the most extensive workshop yet the most creative and innovative. At the end of the final CVAM workshop, there was a strong consensus that the cancer referral process and the Hub provide a better PA interventions system for those living with cancer in the conurbation of interest. Actors' felt the system would increase the percentage of those eligible to join the pathway; thus, assisting many more cancer patients in progressing their normalisation journey and quality of life. For us, the new intervention system offered circularity (Webster, 2016) and is an autopoietic system (Maturana et al., 1980).

The operationalisation of the project's referral process went very well indeed, less so the implementation of the Hub. As indicated above (pp.9-11), several minor factors impeded the creation of the Hub and its support for the referral process intended from the CVAM workshop sessions. We cross-referenced all project elements applying Ulrich's (1986) IS and OUGHT questions, and we eventually pinpointed the deficiency. The project passed quite convincingly the audit against the IS questions and all OUGHT questions, except for the OUGHT question; *what kind of expertise should flow into the system's design?* While the Hub needed to be informed by deliverers and patient viewpoints, it was the viewpoints of the healthcare professionals that would ultimately shape the Hub's design. The contributions of the healthcare professionals in helping to express the current situation and uplift the referral process were invaluable. However, designing what the new Hub should do differently to LWA proved incomplete and less substantial. It immediately turned our thoughts to actors' boundary judgments and recruitment to help advance the Community OR project.

To reiterate, LWA mostly led the selection process to recruit the healthcare professionals and, in doing so, proved the professionals were longstanding members and contributors to their network. In addition, the professionals had satisfied the CVAM-BX criteria, and System actors had validated their contributions in each of the CVAM workshops. So, we eventually realised the issue seemed to be designing the new Hub and what it should do differently to LWA in support of the new referral process. Slack et al. (2001, pp.610-613) are our analogy here. Slack et al. contest that quality systems will stimulate continuous improvement in the operations management function, not necessarily breakthrough, which the Hub is, a new innovative solution. It seems then that for these types of Community OR projects which intend to improve a system that exists and add to the system, we need additional selection criteria to test how well potential actors can specify a new entity to support such a referral process.

It was not very reassuring that after publishing the project's terms of reference and delivering the project's brief in the first CVAM workshop, CVAM-STAR, the project did not result in designs that we could fully implement without further work. Here, we felt the healthcare professionals' bounded rationality (Simon, 2000) hindered or limited their contributions to the

project. Bounded rationality is a theory by Simon to explain an individual's decision-making results from their experiences, knowledge, and analysis method. Because of their job focus, specialisation, skillsets and ongoing professional development, their *frame of reference* (Shamir and Fox, 1969) were only valid for uplifting the intervention system and not necessarily the new entity to support the system. Our experiences of this Community OR project have undoubtedly shifted our thinking away from boundary judgment to boundary critique (Midgley, 2000) by including additional criteria to select healthcare professionals. It is our recommendation to other Community OR systems researchers.

Conclusion

The funded 16-month Community OR project set out to assess the effectiveness of PA interventions for those living with cancer and then design a new referral process to support more patients on their normalisation journey. A Hub was also designed based on LWA's successes in leading and co-ordinating interventions across the conurbation of interest. A diverse range of cancer patients, deliverers and healthcare professionals were recruited to accomplish the project co-led by LWA and guided by CVAM-BX and LWA's network criteria. The recruited System actors' participated in the semi-structured interviews, the CVAM workshops, or both. They eventually co-produced the referral process and Hub after completing each CVAM workshop, including backfilling after some sessions with the inquiry team. Thus, it was with some dismay that after facilitating the workshops and observing the validation processes of each workshop, the blueprint models were deficient and caused us problems when implementing the referral process and Hub, particularly the Hub. However, by applying Ulrich's (1986) IS and OUGHT questions to audit the project, we detected the problem and have since included additional criteria to assess what contributions healthcare professionals could make if participating in a similar Community OR project.

It is crucial at this policy juncture as lifestyle-based secondary preventions (Cancer Task Force, 2015) become further embedded into mainstream healthcare policy that often requires new services configurations, not just improvement, but radical change. We used the systemic change criteria when selecting participants for the Active Ageing (Sport England, 2016) project and a recently launched project inquiring about the illness experience of cancer patients and their relationships with PA. The problems we experienced were in no way catastrophic to the project's success. However, the number of minor implementation issues was unnerving and caused considerable work to rectify. While the PI has deployed CVAM successfully in many previous projects, reflection suggests that it now needs review. First, boundary judgements could be improved by a deeper consideration of power relationships, using an approach such as PEArL (Champion and Stowell, 2001). This approach would provide support to the switch to virtual methods for engaging participants in systemic discovery, e.g., Bongo, Linoit, Microsoft Teams, Padlet, WhatsApp, and Zoom. Second, in conjunction with Ulrich's (1986) critical heuristics, teams can then be alert to closer scrutiny regarding Community OR project boundary decisions through boundary critique (see Midgley, 2000, pp.152-156). When dealing with healthcare agencies and design on new delivery entities, differences of perspective need to be surfaced.

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