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Mixed Methods Research: Creating Fusion from the QUAL and QUAN Data Mosaic

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Abstract:

There is no single recommended means of discourse for presenting and discussing mixed methods research, with lack of data synthesis and process transparency a frequently cited criticism. This paper addresses the deficiency and explores inventive means of data collection alongside innovative approaches to integrating, analysing and articulating qualitative and quantitative sources. A pragmatic philosophy, supported by theoretical and methodological bricolage is advocated and justified.

A panoptic empirical study to elucidate the knowledge sharing influences of middle management in leading UK communication sector operators provides context. A sequential-exploratory and equally weighted QUAL→QUAN design was selected, incorporating emergent evaluation and integration. Innovative qualitative techniques were adopted, namely STRIKE - *STRuctured Interpretation of the Knowledge Environment*, photographic analysis and word cloud visualisation, alongside cultural-web focus groups. This facilitated rich, nuanced and multi-textured data capture to aid the instrument fidelity of a quantitative cross-operator survey. Triangulation was undertaken across all sources to assess areas of corroboration, elaboration or dissonance.

It is demonstrated that this approach enables a multiplicity of perspectives to build successive deepening of understanding; supports transparency, traceability and synthesis; benefits credibility and validation and provides evidence of methodological robustness. This dynamic approach towards the design, conduct, fusion and presentation of mixed methods research therefore addresses a challenging lacuna: to combine rigour with responsiveness, texture with breadth and communicability with complexity. This can foster reflexivity and sensemaking for the researcher and further, can facilitate understanding, engagement and connection for the audience.

Keywords:

Mixed Methods, Pragmatism, Bricolage, Method Integration, Knowledge Sharing

1. Introduction: Mixed Methods in Business and Management Research

A content analysis of papers presented at the European Conference on Research Methodology for Business and Management Studies across 2010 and 2011 (Marais 2012) indicated that qualitative studies are predominant and that only 17% of accepted submissions are classified as multi-methodological. Mixed method research is incorporated within this category: work which employs more than one approach within a single study's design, data collection or analysis, encapsulating philosophical assumptions and actual modes of enquiry (Bryman 2007). Given the complex and dynamic nature of post-industrial organisational contexts; increased application of mixed methods research is considered both timely and germane.

The primary goal of this work was to examine and advance knowledge regarding the design and conduct of mixed methods research to optimise richness, sensemaking, integration and triangulation across qualitative and quantitative approaches, addressing core criticisms and complexities. Responding to an identified gap in the knowledge management literature, contextual attention was directed towards empirical exploration of the influences which impact individual knowledge sharing behaviour at middle management level, affording a holistic, cross-disciplinary perspective within a single study. It is posited that developing understanding which spans technological, human and social factors can be best acquired through the approach elucidated. A researcher-as-bricoleur position is fostered through empirical evaluation of a textured, panoptic and innovative range of data collection, analysis and bridging techniques.

1.1 Paradigm Components, Perspectives and Implications

A paradigm may be described as a worldview: the underlying beliefs, values and assumptions which act as a frame of reference and guide researcher inquiry. Beliefs may be ontological regarding perceptions/assumptions of reality, epistemological concerning the certainty and legitimacy of knowledge, axiological including ethics and rhetorical in respect to researcher voice, creating a "*set of interlocking philosophical assumptions and stances*" (Greene and Caracelli 1997, p6). Paradigm beliefs are normative in nature, impacting on perspectives regarding the credibility of findings. Purists explicitly or implicitly assert paradigm superiority and posit that quantitative and qualitative research methods cannot be mixed within a study or related set due to the epistemological disparity between their theoretical assumptions (Patton 2002).

It is opined that placing approaches in opposition negates the potential to capitalise on respective strengths "*including what each can contribute to the other*" (Wolcott 2002, p99). Complementary dimensions include opportunities for convergent and discriminant validation as well as triangulation, applicability to cross-disciplinary research, and development of broad as opposed to narrow, paradigm lapidific researcher skill-sets (Marais 2012).

Critically, complex evaluation of "*real-world*" (Rallis and Rossman 2003, p493) scenarios frequently necessitates crossing paradigmatic boundaries to seek nuanced answers to the diversity of questions posed, aligned with flexibility in approach. This is pertinent to the high-technology UK communications sector: a knowledge intensive, dynamic environment with challenges including strong market competition, pricing pressures and converging data architecture across mobile, social media and the cloud (Accenture 2013). A single paradigm approach of pragmatism is adopted to address this, as advocated by Morgan (2007).

1.2 Pragmatism and Bricolage

A pragmatic approach (Feilzer 2010) combines the inductive logic of qualitative exploration, the deductive reasoning of quantitative confirmation and further, the creative problem-solving emphasis of abduction (Johnson and Onwuegbuzie 2004) to generate useful and reliable knowledge for both theoretical and practical application. This is pertinent to the Business and Management domain which embraces increasingly pragmatic disciplines such as Information Systems (Ågerfalk 2010) that combine theory with practical research and implications.

It is important to justify this choice which the author regards as a means to bridge philosophy and methodology (Cameron 2011). Epistemological and technical concerns are combined; the nature of the knowledge that is produced and the methods adopted to generate it (Morgan 2007). Problem-driven but theoretically cognisant, practical judgement is employed to make methodological choices which optimally address research questions and enable successful outcomes. Applying critical reflexivity, research is conducted in consideration of, but not wholly constrained by, underlying philosophical debate. Pragmatism supports methodological pluralism, the case for which has been described as "*irresistible*" (Hirschheim 1992, p30).

Bricolage can guide pragmatic practice with a position of "*researcher-as-bricoleur*" (Denzin and Lincoln 2011, p4) considered congruous to navigate the contextual complexity which drives "*the need for multiple ways of seeing*" (Kincheloe 2005, p327), interdisciplinary awareness and the adoption of inventive, imaginative and resourceful research choices. Both methodological and theoretical perspectives are relevant and allow eclecticism where appropriate, promote surfacing of new meanings and insight (Deuze 2006) and further, can aid the removal of "*blindness*" to facilitate cross-discipline development (Denzin and Lincoln 2011, p168).

It is recognised that this approach increases demands on the researcher, including the need to appreciate a variety of discourses and knowledge of multiple methods: their application, combination and evaluation. It is argued that this is both a valuable skill-set to acquire and perspective to understand, particularly relevant to Business and Management research which is frequently underpinned by related themes of sensemaking and improvisation.

2. Methodology and Method Selection

2.1 Research Design

To support the reflective, pragmatic methodology elucidated, an equally weighted, sequential-exploratory mixed methods design with instrument development was selected (Milton et al. 2003), summarised as QUAL→QUAN. Following reflection on researcher skills, resources, pre-knowledge and phenomenon character (Cronholm and Hjalmarsson 2011), this configuration was considered optimal to provide alignment with, and attention to, stated research goals (Onwuegbuzie and Teddlie 2003). It also supports the underlying rationale of benefiting instrument fidelity, significance enhancement (Collins, Onwuegbuzie and Sutton 2006) and researcher flexibility.

Application of an emergent point of interface (Morse and Niehaus 2009) aims to facilitate integration of developing findings as opposed to only separate analysis, promoting connections to be forged between the qualitative and quantitative components. This process can be complex and necessitates transparency, an aspect insufficiently addressed in mixed methods research (Bryman 2007). As predicated by Rosenberg (2008, p245), researcher choices are "*rationaly justified*".

2.2 Qualitative Stage: Context and Method Alignment

Building on an expansive literature review, the initial qualitative phase was explorative, descriptive and explanative in orientation (Johnson and Christensen 2004). This affords close attention to the knowledge sharing phenomenon of interest and facilitates nuanced understanding of the actor lifeworld (Habermas 1984) through processes of data deduction (Onwuegbuzie and Teddlie 2003).

Focus was directed at surfacing influences of individual knowledge sharing behaviour within a single communications operator post joint-venture change. This organisation is subject to dynamic transformation processes impacting strategic realignment, restructuring and rebranding. Data was anonymised and aggregated where appropriate to protect identity. The collection process is informed by the "*preunderstanding*" (Gummesson 2000, p57) and emic awareness gained via insider-researcher status. The potential for relativity issues was balanced through the etic position of non-insider peers with whom anonymised emergent findings were discussed, the innovative range of techniques employed, and reflection on practitioner research learning experiences (Mercer 2007).

Research was conducted in Q3 2012 utilising the original observational framework STRIKE and focus groups as primary data collection methods, supported by photography and word cloud visualisation. Middle managers in the IT Support Function were identified as the target audience due to their pivotal brokering role in knowledge sharing practices (Nonaka and Nishiguchi 2001). Method detail and rationale are fully appraised.

STRIKE: *STR*uctured *Inter*pretation of the *Knowledge Environment*

Drawing on systems analysis expertise, the author identified the potential to augment the supportive observational tool STROBE (Kendall and Kendall 1984). STRIKE is the emergent design artefact: an unobtrusive and multidimensional framework to observe and evaluate the knowledge environment comprising elements such as office layout, design and aesthetics, desk placement, workspace decoration, props, external knowledge sources and branding. It is posited that its adoption can align with and moreover, enrich interactive methods. With reference to the Design Science Research method (Heje, Baskerville and Venable 2012), a descriptive ex-ante evaluation was completed by iteration during a pilot study in a comparative naturalistic setting. Face analysis was undertaken following an approach to Dr Gordon Rugg from Keele University, an expert in knowledge elicitation.

Focus Groups

Johnson and Scholes's (1999) cultural web framework was employed within a focus group setting to aid examination of knowledge culture. Four sessions were undertaken, comprising 10 actors of equivalent position per group (N=40). A semi-structured topic guide was prepared with informed

consent obtained for audio recording and the use of resultant output material. Attention was afforded to semiotics, semantics and the potential impact of memory bias. Thematic analysis and word cloud visualisation of findings were utilised to provide flexible data evaluation with potential subjectivity issues addressed by engaging expert, non-participant review.

Photography

Photography may be utilised in both an illustrative and interpretive mode within which ethical concerns must be considered, notably consent, respect and confidentiality. Photographs are “*quasi-representational*” in nature (Warren 2005, p861) and were employed to enrich and complement STRIKE observation, augmenting narrative. This facilitates communicability, understanding and aids visualisation of context, providing a frame of reference for reflection.

Word Cloud Representation

Wordle is a “*visually rich*” medium that can be employed as a supplementary research tool (McNaught and Lam 2010, p630) supporting thematic analysis. No instances of its adoption are observed within the Business and Management domain. Wordle was utilised to create a word cloud analysis of participant responses from the focus group sessions. The cloud is a visual representation of the output text based on word frequency with all data saved privately to preserve confidentiality. The methodology of Rivadeneira et al. (2007) was consulted to facilitate the data analysis process.

2.3 Method Integration and Bridging Between Phases

Using a thematic checklist format, observational findings from STRIKE were compared against focus group data to assess whether each component was confirmed, reversed, modified, supplemented or would benefit from further investigation. Focus group participants were then invited to attend a post evaluation session to discuss the interpretation, with the consensus achieved posited to add additional legitimacy. To optimise instrument fidelity, qualitative findings were compared to potential influences on knowledge sharing identified at literature review so that augmentations, additions or removal of scale construct items could be incorporated.

2.4 Quantitative Stage: Context and Method Alignment

This phase was descriptive and explanative in orientation. A purposeful sampling approach was adopted to identify middle management participants (N=78) across the IT Support functions of four leading UK communications operators, classified by market share. Survey distribution was undertaken via a web-based option, drawing on Baatard’s (2012) technical guide to optimise balance between researcher requirements and respondent experience.

The dependent variables of tacit and explicit knowledge sharing were measured across self-report questions employed or adapted from the behaviour scales of Yi (2009) and Reyhav and Weisberg (2009). These were selected due to scope, relevance and demonstration of dimensionality, reliability and validity. Augmenting Ipe’s (2003) study, independent variables were aligned across five core influence factors: motivation to share, knowledge type (tacit/explicit distinction), opportunities to share, nature of the individual (personality, demographics) and culture. A five point Likert scale was adopted for attitudinal measurement with findings subject to reliability, correlation and regression analysis.

Open-ended questions were included to encourage additional insight and elicit survey feedback, with data evaluated through thematic review and word cloud visualisation. Dr Gordon Rugg conducted content validity analysis on construct design and survey wording, with focus directed at reducing self-reporting bias. Awareness of potential dissonance between espoused and actual behaviour is reflected in the overall approach adopted, employing a range of methods of knowledge elicitation.






3. Integrated Presentation and Discussion of Core Findings

Articulation and discussion of integrated findings is a noted challenge for mixed methods research (Flick 2007), especially within word limit constraints. Core results are therefore presented sequentially with integration and evaluation evidenced on an emergent basis. Textual and visual approaches are utilised to aid communicability.

3.1 STRIKE Observation

Table 1 demonstrates STRIKE in action and its practical implications, for example whether the lack of external information sources observed might reflect a knowledge gap. Photography has been incorporated to illustrate, enrich and complement researcher observation, providing both transparency and the ability to actualise place. A reduced data set is presented to preserve anonymity.

Table 1: STRIKE Evaluation

Environmental Element	Description	Supporting Photography
Office Location and Environment	Meetings in open, equipped locations, facilitating interaction and exchange. Functional, neutrally decorated office aesthetics.	
Desk Placement	Combination of fixed partitioning and management collocation may negate optimisation of equal exchange.	
Decoration	Frequent observations of objects from previous team events with branding associated with pre joint-venture heritage. This reflects pride and implies nostalgia.	
External Information Sources	Employees maintain personal libraries and individual subscriptions to professional bodies which may indicate self-directed or hoarding behaviour. Company magazines rather than industry journals are observed implying a lack of inward external knowledge flow.	
Office Lighting and Colour	White neutral walls – furnished with memo-boards and subtle accents of colour in communal spaces. Contrasts with bright, strongly decorated desk areas.	

3.2 Focus Groups

Use of the cultural web afforded an effective scaffold for discussion regarding behavioural norms. Reflecting on the use of visualisation as a means of representation in other practitioner contexts, Wordle was employed to evaluate findings in conjunction with the thematic analysis of transcripts. Figure 1 provides an example of this approach in praxis, demonstrating its evaluation and communicability value.

Figure 1: Knowledge Sharing Barriers by Word Cloud Visualisation



Findings were compared to a thematic analysis with culture, time, change, systems and budget emergent as key issues. Respondent articulation of hoarding aligns with the interpretation of related behaviour identified via STRIKE, providing corroborative evidence. Word choice selection is illuminating, notably the negative connotations of “inadequate”, “stupidity” “ignored” and “isolated” stated in relation to current culture. This adds a layer of understanding to the evidence of nostalgia towards the pre-joint venture state observed through STRIKE. The credibility and self-awareness of participants is reinforced by observations of adept use of kinesic communication via body language, with purposeful hand gestures employed to emphasise a point made. This use of creative approaches and products as interpretive text is appropriate as part of methodological bricolage (Yardley 2008).

3.3 Emergent Integration

Qualitative findings broadly supported the knowledge sharing influences identified at literature review. Adopting selection criteria of theme frequency and articulation (Cronholm and Hjalmarsson 2011), proposed independent variables and construct items across the five influence factors were then revisited: a core benefit of this emergent approach. As an example, amendments to address the potential for divisions between individual and organisational orientations towards knowledge management strategy were incorporated. Depth of insight achieved into the complex and evolving contextual dynamics within the single operator was also a key outcome, providing perspective and data richness for cross-operator comparison.

3.4 Quantitative Survey

There are limitations to the extent in which extensive quantitative survey findings across 50 questions can be presented within word limit and structuring confines, a noted issue for mixed methods publications (O’Cathain, Nicholl and Murphy 2009). Consistent with the approach adopted throughout the paper, transparency is maintained with the intent to articulate pertinent overall findings within an integrated single article (Stange, Crabtree and Miller 2006).

The data obtained comprised a majority of males (N=60, 76.92%), in the age range 50-59 (N=30, 38.46%) and with significant industry experience of more than 15 years (N=48, 61.54%). This aligns with the population profile of the UK IT and Telecommunications Sector (E-Skills 2012). Reliability analyses were conducted on all scales in order to determine the level of internal consistency reliability, achieving acceptable Cronbach Alpha coefficients above .70.

A plethora of constructs related to motivation to share, knowledge type, opportunities to share, nature of the individual and culture were found to directly and significantly influence sharing practice across all operators: justifying the holistic approach and extending the work of Ipe (2003). Differences in

behaviour are identified based on the type of knowledge shared, supporting the tacit and explicit distinction utilised. Some variance in sharing norms was observed in the joint venture organisation as opposed to the other operators, with reduced volition and capacity to share identified across constructs within the nature of the individual, opportunities to share and motivation to share factors.

3.5 QUAL-QUAN Triangulation

A synthesising cross-phase triangulation was performed, building on the between-method evaluation of STRIKE and focus group data. Findings for core themes were compared across primary and secondary methods of enquiry. Use of a matrix format table facilitated the comparative process and provided a reflective focus for the researcher to bridge data sources, identifying areas of congruence and dissonance. Credibility was enhanced by a high level of traceability between empirical and behavioural findings. Insight was also achieved regarding the differences in sharing practice identified in the single operator as opposed to its competitors. This is subject to additional study to develop predictive capability connecting transformational organisational change and knowledge sharing volition, aspects considered beyond the scope of this paper.

4. Benefits of Approach and Practical Implications

This study supports adoption of a pragmatic philosophical perspective in mixed methods research purpose and design, facilitating consistent conceptualisation and convergence. Combined with an emergent point of interface, it provides a scaffold for researchers to react and gain from in-process research findings, as demonstrated by the augmentations to instrument design enacted following initial qualitative interpretation. The sequential approach enabled cumulative development of understanding which was enhanced by undertaking triangulation both within and across phases. This benefits the depth of knowledge achieved regarding the phenomenon under study and further, provides a rigorous defence against validity criticisms. Robustness of findings is also enhanced by attention directed to key epistemic criteria (Marais 2012) and the transparent, sound justification and elucidation of research choices with challenges such as data presentation acknowledged, addressing a core criterion for study evaluation (Paul and Marfo 2001).

Regarding the specific research context, it is argued that the innovative combination of data collection, analysis and bridging techniques employed surfaced a breadth and nuanced range of knowledge sharing behavioural influences and facilitated comparison across organisational settings. This outcome could not have been achieved by a purely monomethod design or moreover, to the same scope and depth, in a mixed methods study that utilised a more restricted range of approaches. Underpinning this, the transparent adoption of theoretical and methodological bricolage was found to aid examination, querying and ordering of researcher resources and selection, resulting in unique data combinations and providing a scaffold for improvisation.

In terms of specific methods, word cloud visualisation is opined to be particularly effective as both a researcher evaluative tool and as a communicative device to engage an audience, therefore addressing a noted difficulty (Lieber 2009). This technique effectively enables multiple pieces of information to be represented in a compact and simultaneous manner. A verification check against focus group transcripts is recommended to ensure accurate representation.

Further, STRIKE demonstrates capacity to provide a rigorous, unobtrusive and multidimensional framework to facilitate observation and evaluation of knowledge environments, synthesising structure, creativity and contextual flexibility. Photography provides both interpretative and "*evidential power*" (Dant and Gilloch 2002, p17) to support the method. Utilisation of STRIKE can align with and enrich interactive techniques to elucidate the actor narrative and behavioural norms, motivators and inhibitors; thus, affording significant organisational diagnostic and potentially prescriptive capability. This technique is therefore regarded as especially utile to bridge the frequent dissonance between theory and practice with usability for researcher and practitioner alike. Following the successful descriptive ex-ante and ex-post naturalistic evaluation (Heje, Baskerville and Venable 2012), it will be subjected to further research to assess capacity to perform in a variety of contextual circumstances.

5. Conclusion

This study contributes to both mixed methods and knowledge management literature. It confirms the applicability and benefits of a QUAL→QUAN sequential, exploratory design to elucidate a critical dimension impacting across Business and Management disciplines: the panoptic, cross-disciplinary range of influences affecting individual knowledge sharing behaviour. Considering the link between sharing practice and organisational performance (Rašula, Vukšić and Štemberger 2012), the design and encapsulated techniques afford particular value.

The capability to elucidate different perspectives and dimensions of a phenomenon may also be applied to a range of contextual settings and problem areas, combining nuanced local focus with wider generalisability. The method orientation supports traceability (Cronholm and Hjalmarsson 2011) and advancing previous findings, this configuration is also found to benefit contexts where researcher pre-knowledge is high but the phenomenon is subject to dynamic change. Primary methods STRIKE, focus groups and the quantitative survey are innovatively supported and enriched by secondary techniques including photography, word cloud visualisation and attention to language. The multi-layered, methodological rigour achieved also mitigates the difficulties of mapping reports of behaviour onto actual behaviour, aiding validation of intersubjective agreement. Adoption of an emergent point of interface optimises instrument fidelity and combined with triangulation across behavioural and empirical data, moves from a mosaic to fusion (Bazeley 2010) of linguistic, textual and physical data, achieving both breadth and subtlety of understanding.

Addressing the mixed methods challenges detailed by Bryman (2007), Lieber (2009) and Cameron (2010): the philosophical foundation and paradigmatic stance of the study is explicitly stated, method selection justified and robust within-phase and cross-phase integration and triangulation undertaken. Presentation challenges, usability and meaningful audience engagement are considered. Responding to the call for competence capacity building, researcher versatility, creativity and diversity of skill sets employed is both developed, and robustly demonstrated. Practical guidance is afforded for researcher and practitioner, underpinned by pertinent theory and empirical assessment and it is intended that this paper will both stimulate discussion and promote an increased application of approach.

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