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Advances in Qualitative Comparative Analysis (QCA): Application of fuzzy set in business and management research

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Advances in Qualitative Comparative Analysis (QCA): Application of fuzzy set in business and management research

1 Introduction

Following from the seminal book of Charles Ragin in 1987, qualitative comparative analysis (QCA) has gained increasing acceptance in social science research for systematic comparative case analysis (Rihoux 2006). The QCA approach is built upon the set-theoretic comparative technique, primarily Boolean algebra, and has been introduced as a “synthetic strategy” for integrating the strengths of qualitative and quantitative methods while overcoming the key concerns inherent in both the approaches (Ragin 1987:84). Berg-Schlosser and De Meur (2009:17) define it as “a nonlinear, non-additive, non-probabilistic conception that rejects any form of permanent causality and that stresses equifinality (different paths can lead to the same outcome), complex combinations of conditions, and diversity”. The Boolean or crisp-set technique is the first QCA version, while fuzzy set technique is a more recent extension (Ragin 2000, 2008a). Unlike crisp sets that assign dichotomous membership, fuzzy sets permit partial membership in a category, meaning both causal and outcome variables can be multichotomous (Stokke 2007).

Although social science research has a long-lasting tradition of prioritising variable-oriented quantitative methods, the popularity of case-oriented qualitative techniques has also been developing at a steady pace (Ragin 1994; Ragin and Becker 1992). Nevertheless, case-oriented qualitative research is often criticised to be weak in terms of external validity for placing overly emphasis on the specifics of an individual case. The internal validity is also in question considering the method’s inability to choose between various possible or plausible explanations of a phenomenon. This problem, regarded as degrees-of-freedom or ‘small-N problem’, means that “there are too few observations relative to the set of variables under consideration to determine the relative significance of the causal factors” (Stokke 2007:501). Qualitative researchers tend to compensate for this issue by paying attention to complexity and depth in a given case (Ragin and Becker 1992). In this respect, Ragin (1987:51) argues that the term “small-N problem” misrepresents the challenge confronting case-oriented research, since “it is not the number of relevant cases that limits the selection of method... but the nature of the method that limits the number of cases and the number of different causal conditions that the investigator is able to consider.” The QCA technique is designed to overcome this small-N problem and is equipped to handle only a limited number of cases. The approach will not only increase the number of cases but also will find similarities and differences across cases on a configuration of causal conditions in order to identify patterns with possibilities for modest level generalisation (Rihoux and Ragin 2009).

Although initially applied in political and historical sciences, QCA offers particular promise to organisational researchers (Rihoux and Ragin 2009). Fiss (2007:1180) argues that “organisations are best understood as clusters or interconnected structures and practices, rather than as modular or loosely coupled entities whose components can be understood in isolations”. The QCA approach is fundamentally based on the idea that the patterns and attributes will exhibit different features and lead to different outcomes depending on how they are arranged. Therefore, the approach stresses nonlinearity and synergy of depth and

breadth within and across cases (Ragin 2014) which is typical of real-world qualitative research (cf. Sinkovics and Alfoldi 2012). However, this contrasts with a long-tradition of organisational research in the application of econometric or statistical tools which imply linearity.

Against this context, the use of QCA in the field of management is beneficial for the understanding of complex management phenomena. It combines qualitative investigation with quantitative analysis. A recent Journal of Business Research special issue (Roig-Tierno, Huarng, and Ribeiro-Soriano 2016) published forty six articles on QCA and illustrates the potential for management research. In their lucid overview article, Seny Kan et al. (2016) show that 95 articles use QCA in management research. Their classification highlights its use in general management, marketing, innovation, strategy, human resources, organization studies and operational research. The result of their article suggests that researchers apply QCA to four management situations: the internal environment, the external environment, links within and between these environments and the optimal way to question management phenomena. The use of QCA in the special issue extends the application to entrepreneurial activity, organizational strategy and management performance (Roig-Tierno, Huarng, and Ribeiro-Soriano 2016).

To this end, the purpose of this chapter involves presenting, discussing and explaining the QCA method and highlighting the application of the method in business and management research. The chapter is, therefore, organised in the following way: first, we present the QCA approach discussing its history, epistemology and key methodological features; second, we shed light on the progress in the application of QCA approach by highlighting the patterns thus far; and finally, we detail the method for its application and exemplify the conceptual considerations presented earlier. The chapter concludes with a summary and suggestions regarding future avenues for using QCA approach in the field of management research.

2 Background on QCA and fsQCA

QCA is the umbrella name for two main types of techniques: crisp set qualitative comparative analysis (csQCA) and fuzzy set qualitative comparative analysis (fsQCA) (Rihoux 2006). Both the methods are designed to transfer subjective data into numeric ones by assigning values of either 0 and 1 (crisp) or in-between 0 and 1 (fuzzy). Crisp set qualitative comparative analysis (csQCA) was the original version of QCA and is built upon the binary language that George Boole developed in the mid-1800s. The Boolean algebra is also the mathematical basis of computer technology. Boolean algebra does not manipulate numbers but rather systematizes logical expressions in order to sort data and create a list of the configurations of circumstances associated with a given outcome (Stokke 2007). The application of crisp logic for systematic comparative procedures dates back to 18th and early 19th century primarily in natural sciences (Rihoux and Ragin 2009).

Fuzzy set qualitative comparative analysis (fsQCA) is a much later extension to QCA and is built upon the fuzzy set theory (Ragin 2008a). The introduction of fuzzy set theory dates back to the sixties with the publication of seminal articles by Zadeh (1965) and Goguen (1969). Zimmermann (2010) highlighted that the development of fuzzy set has mainly been in two key areas: first, as a formal theory with increasing sophistication and specification being added to the original ideas and concepts of Zadeh (1965); and secondly, as fuzzy-oriented application in problem solving and research. The acceptance of fuzzy set gained momentum between 1960s and 1970s with its first application in controlling technological processes. The successful use of fuzzy rule based system, namely fuzzy control, in the

manufacturing of washing machine, video cameras, subway trains and heavy machineries by Japanese technology firms triggered the interest in further application of the method in scientific research during 1980s.

The application of classical set theory in social science research followed from a seminal volume by Charles Ragin (1987). In a series of publications (e.g. Ragin 1987, 1994), Ragin introduced the use of crisp set qualitative comparative analysis in social science research. During the 1980s and 1990s, csQCA was mostly applied in political science (comparative politics) and historical sociology (welfare state studies) research. As a result, csQCA was initially adopted in the social science as a tool for macro-level studies involving entire societies, economies, states or other complex social and cultural formations. The organisational researchers have applied the method in meso-level (i.e. firm-level) studies in recent years (Rihoux and Ragin 2009).

Zadeh (1965) argues that fuzziness is contained in human language including human judgement, evaluation and decisions. Drawing upon this argument, Ragin (2000) contends that fuzzy set theory can be a powerful tool to capture the fuzzy nature of human language that remained difficult thus far through the application of dichotomising techniques of csQCA. Therefore, built on crisp sets csQCA, the key strength of fsQCA lies in providing the variance of the observations.

Developed around the Boolean binary logic (scores of 0 and 1), csQCA assigns membership to cases across a configuration of condition, in which a score of '1' reflects 'full membership' and '0' reflects 'no membership' in a specific set of conditions. While csQCA assigns dichotomous membership ('yes=1' or 'no=0') to the cases across a set of conditions, fsQCA addresses degree of membership in sets by assigning intermediary numbers between 0 and 1 (Rihoux and Ragin 2009). Ragin (2008a:30) claims "fuzzy sets have many of the virtues of conventional interval and ratio-scale variables, but at the same time they permit qualitative assessment." For instance, in the fsQCA approach, a membership score of 1.0 indicates full membership in a set; scores close to 1.0 (e.g. 0.8 or 0.9) indicate strong but not quite full membership in a set; scores less than 0.5 but greater than 0.0 (e.g. 0.2 or 0.3) indicate that objects are more "out" than "in" a set, but still weak members of the set; a score of 0.0 indicates full non membership in a set. The score 0.5 reflects maximum ambiguity or fuzziness in the assessment of whether a case is more in or out of a set. Thus the variables (condition and outcome) can be calibrated aiding the construction of the truth table through use of substantial theoretical knowledge and evidences from cases (Rihoux and Ragin 2009). As pointed by Ragin and Amoroso (2011), fuzzy sets are simultaneously quantitative and qualitative: full membership and full non-membership are qualitative states, while varying degrees of membership are quantitative measurements ranging from more out (closer to value 0) to more in (closer to value 1).

Epistemologically, the QCA approach (both csQCA and fsQCA) is a middle way between the case-oriented qualitative research and variable-oriented quantitative research (Rihoux 2006). On the one hand, the qualitative approach emphasises the complexity of a social phenomenon and offers in-depth detail about small number of cases/instances. On the other hand, quantitative approach is interested in generalisation and finding patterns that are evident in large number of cases/instances. One of the key criticisms of the quantitative approach relates to its difficulty in addressing actors' underlying motives to certain responses, observing the subjectivities and sequences of the events and deriving the causal connections. Qualitative methods, by contrast, excel in these areas. However, with a qualitative approach, it is difficult to claim that the findings are generalizable due to its reliance on small number of cases. Despite this methodological divide, qualitative and

quantitative approaches could be complementary and mutually dependent. For instance, qualitative researchers often cite general patterns that they have learned from previous quantitative studies in order to explain case specific phenomena. On the other hand, quantitative researchers also cite unobserved case-level mechanisms to explain the cross-case patterns they document. This complementarity and mutual dependence underpins the idea of building a bridge and finding a middle ground where concerns of both worlds can be met (Ragin 2000). The QCA approach offers this middle ground between the issue of generality as portrayed in quantitative study and complexity in qualitative study.

Ragin (1987) contends that the QCA approach resolves some of the methodological issues inherent in qualitative and quantitative approaches and strengthens the connection between the two approaches. QCA (and fsQCA) approach has its fundamental tie with case-oriented research, which has the unique strengths of understanding the cases within their context, the causations in conjunction and outcome as results of combination of conditions. While clutching these unique strengths of case-oriented approach, QCA is developed to formalise those by using Boolean algebra. Nevertheless, case-oriented researchers often claim that their findings are specific to individual cases and thus, faced with large number of cases, they find it difficult to sustain their attention to complexity and also to address the similarities and differences across many cases. By contrast, a variable-oriented approach is more interested in variables across large number of cases to find correlation between those, and in the process, the cases lose their identity and the context gets overlooked. While holding its case-oriented tradition, QCA is designed to handle larger number of cases, at the same time, examine the causal complexity in those cases by avoiding the simplifying principles of variable-oriented research. It is, therefore, a ‘synthetic strategy’ that is interested in both within-case and cross-case analysis (Ragin 2014:84). On the one hand, the emphasis on breadth as in variable-oriented approach is retained through analysis of more than just a handful of cases, which is seldom done in case-oriented research and on the other hand, the attention to depth is given by focusing exclusively on the specificity of individual cases and maintaining intimacy with the context (Rihoux and Ragin 2009).

Rihoux and Ragin (2009) had listed four key features of QCA: i) causality, complexity and parsimony; ii) modest generalisation; iii) ideas and theory and iv) data, replicability and transparency. Firstly, in QCA approach causation is typically understood conjecturally, as combinations of conditions. It is interested in causal complexity, which Ragin (2008a:23) defines as “a situation in which an outcome may follow from several different combination of causal conditions, that is, from different recipes”. These configurations of causally relevant conditions are compared across cases to link those to outcomes (Ragin 2008a, 2014). The key tool for analysing causal complexity in QCA is the truth table, a tool that allows structure focused comparisons (the process of constructing a truth table is detailed in the methodology section). In comparative analysis, causal conditions do not compete with each other, as they do in variable-oriented analysis while deriving correlations; they rather act in combination to generate a specific outcome. Again, different combination of conditions may also lead to the same outcome, for example, different social forces leading to the emergence of welfare states in Western Europe (e.g. Alber 1995). Thus Rihoux and Ragin (2009:8) refer this characteristic as “multiple conjunctural causation” in which, the word “multiple” refers to the different paths to produce same outcome and “conjunctural” conveys that each path is a combination of conditions.

Secondly, the QCA approach allows comparing small to intermediate number of cases (referred as ‘small-N’ or ‘intermediate-N’ (Ragin 1987)) as configuration to identify similarities and differences across cases. The cases are compared in a truth table to identify the ones displaying identical configurations of causal conditions and the ones differing on

one or more causally relevant conditions (Ragin 2014). This process allows finding patterns among low number of cases such as, 2 to intermediate number of cases, say 50 to 100. Therefore, QCA is equipped to support “modest generalisation” in a small-N or intermediate-N situation (Ragin 1987:31). This systematic comparative analysis facilitates formulating propositions which can then be applied to other similar cases (of course, with caution). However, the robustness of generalisation is greater in variable-oriented research allowing very broad generalisation (Rihoux and Ragin 2009).

Third, the QCA approach facilitates a dialogue between theory and cases. The cases are considered as a specific combination of properties within a specific context – a ‘whole entity’, while in variable-oriented research, the cases and context are lost in the course of variable search and analysis (Ragin 2014). Therefore, the research needs to have in-depth understanding of the cases, which aids the identification and development of the configuration of the conditions. The cases are not randomly selected from a population rather are carefully selected in consultation with historians, country experts and others and each case are well known having an identity rather than being anonymous. Therefore, the process of selecting the understanding the cases are holistic and inductive. The choice of conditions also needs to be theoretically informed, which adds a deductive dimension to the QCA approach. The theoretical knowledge also contributes for the selection of the cases including the exceptions and outliers and also treatment of the contradictory configurations (i.e. the cases that display the same values on the condition variables but lead to different outcomes (Rihoux and Ragin 2009). The interpretation of the findings should also have to be derived from theoretical knowledge. With having both deductive and inductive aspects embedded in the process, QCA is equipped to generate mid-range theories (Rihoux 2006).

Finally, with the use of Boolean algebra, the QCA offers tools that are both formalised and replicable. The QCA allows assigning numbers to data that are originally subjective in nature and thus making the study replicable. The process of selection of variable, processing them and intervening during the analysis are transparent. The researcher has to constantly refer to the case and go back-and-forth which requires a rich data and theoretical knowledge. Thus the approach is not a mere mechanical and “push-button” oriented one rather requires researchers’ constant engagement which makes the process more transparent (Rihoux and Ragin 2009).

3 QCA in business and management research

The rationale why researchers use QCA in management is that the complexity of the management phenomena and the understanding the management practices asks for more refined modes of investigation. An in-depth knowledge of the cases and a robust manner to analyse them. QCA has three variants – crisp-set, multi-value and fuzzy-set. Seny Kan et al. (2016) investigated the use of QCA in management research and found that in most articles it serves the renewal of the understanding of management situations. QCA can be positioned between exploration and hypothesis testing and it has an original role in strengthening knowledge generation through a dialog between case studies and theory. Finally, QCA is helpful in limiting the recurrence of mismatches between theory and methods in management research. The authors emphasize that the QCA has two forms of explanatory paths: 1) a specific management reality could have a multiplicity of causal paths – equifinality. 2) asymmetric nature of management phenomena. Overall, QCA offers the depth of qualitative research and a coherence for understanding the configurations of the antecedents leading to the outcome of a phenomenon. Many paths can lead to an outcome in managerial research.

Seny Kan et al (2016) show that fuzzy set is the most common of the three variants of QCA and the studies were empirical, theoretical and methodological. Important for the use of cases is that the unit of analysis can be organization, individual, country or state. This chapter highlights the recent developments in QCA in management research and positions it in this respect.

The scope of small-N to full-N enables fsQCA to be used in qualitative and quantitative investigations. FsQCA in the latter is mostly used to complement quantitative findings in providing asymmetric relationships of the analysis. The fsQCA approach in qualitative research gives the robustness of the results and the generalizability of the findings. The critiques of qualitative research can be circumvented in this case, since validity, reliability and authenticity of the results are positioned in a more convincing way with fsQCA. With fsQCA the researcher can distinguish between necessary and sufficient conditions for the occurrence of managerial phenomena and by being able to do this, a central criticism of management research – the lack of actionability (Seny Kan et al, 2016) can be addressed.

Insert

Figure 1 about here

The use of fsQCA in business research can be considered in a more structured way after the publication of more than hundred articles. Seny Kan et al (2016) and Roig-Tierno et al. (2016) provide classifications of the articles using fsQCA in management research. Figure 1 above shows the frequency of fsQCA use in the respective functional areas of management.

Interviewing actors on different organizational levels helps to find out about organizational and managerial phenomena which need an exploratory approach for knowledge generation. Seny Kan et al (2016) moved away from a functional perspective and focussed on the four configurations below:

Internal environment. Mostly organizational structure and strategy papers use fsQCA for their investigation into procedures, strategies and performance.

External environment. The relationship of the actors with customers, suppliers, HQ, governmental bodies benefits from an in-depth analysis of the cases for managerial research.

Entrepreneurship activities. As a new approach towards understanding small enterprises, interviewing entrepreneurs shows a valid empirical and theoretical unit of analysis by focusing on the individual and the decision-making of business leaders.

Innovation and performance. This stream of research in fsQCA is important and transferred to many different levels from individual to country and shows the reliability of the findings in terms of necessary and sufficient conditions for the outcome.

The recent Special Issue of set theory (fsQCA) in the Journal of Business Research can be seen in structuring fsQCA in management according to entrepreneurial, organizational and performance configurations in management. The table below summarizes the extensive use of fsQCA in this respect.

Insert

Figure 1: The use of fsQCA in management research (Seny Kan et al. 2016)

Table 1 about here

The applications for fsQCA are manifold and offer a research agenda for many years to come. The next section offers an example fsQCA application.

4 fsQCA application example

This example uses Ragin's (2008b) manual for fsQCA software as a guide on how to work with the collected data and transfer it into fsQCA results. The example below goes back to Ragin (2008a) and Rihoux and Ragin (2009). This is especially beneficial, since the country comparisons chosen are an important approach to provide a classification and calibration for an introduction into fsQCA. The data is in general collected with an excel spreadsheet and then saved with comma separated (csv) format which will lead to the table below when starting the fsQCA program.

From interviewing to calibration, the data collection with interviews benefits from an indepth knowledge of the researcher. As Ragin (2008a) points out, the researcher needs to know the subject, interviews, theory and method well to be able to generate new insights with fsQCA. The number of interviews or cases can be from small N to medium N. Large N are only used to compare quantitative studies (Regression models of symmetric relationships) with fsQCA (asymmetric relationships). The interview data can then be structured into themes which make up the conditions (antecedent, concurrent and consequential). The example below uses gross domestic product, manufacturing sector, strong unions etc. (macroeconomic conditions for country perspectives). The next step is the generation of a calibration table in which the qualitative results are translated into memberships of sets. Full membership in a set is considered at 1 and an empty set is 0. All the grey levels in between will be positioned between break points (0.5; 0.33 and 0.67; 0.2, 0.4, 0.6 and 0.8). This is the important part for the transfer from qualitative to quantitative analysis. The Figure below shows therefore values between 0 and 1.

Insert

Figure 2 about here

The table in figure 2 above shows the cases in the first column and the conditions generated from the calibration table. In this case *gdpr* stands for affluent, *inqf* is substantial income inequality, *manf* is strong manufacturing sector, *unf* is strong unions and *weakcv* stands for weak class voting (Ragin, 2008, 75). To generate a truth table analysis, the user will need to go to 'Analyze' and then to 'Fuzzy Sets' and 'Truth Table Algorithm'. The screenshot below should guide the reader towards creating the truth table, which follows in two easy steps. The outcome condition will be chosen first and then the conditions leading to the outcome are then clicked into the causal condition section. Clicking on the run button will bring up the truth table.

Insert

Figure 3 and 4 about here

The truth table shows the causal conditions, the number of the cases with the combination, and the outcome condition as well as consistency values, for example let's take the first row with 3 cases or 25% covered by the joint set of *gdpr* and *inqf* and the empty cell

for outcome and 0.95 for consistency. The truth table represents 2^k rows (where k represents the number of causal conditions) which is a reflection of all possible combinations of causal conditions.

The outcome condition *weakcv* is blank and it is up to the researcher to determine the outcome for each configuration. Consistency values are shown in column *consist* and show the degree to which membership in that corner of the vector space is a consistent subset of the membership in the outcome (Ragin, 2008b, p. 77). After applying the frequency threshold of 1 to the data and reducing the table by the configuration that do not have any observations. The consistency threshold of 0.9 is selected and 1 is placed in the *weakcv* (outcome) column for configurations with 0.95 consistency and greater and 0 for cases with lower consistency.

Insert

Figure 5 about here

After constructing the truth table the researcher can select 'Standard Analyses' and this leads to the provision of the complex, intermediate and parsimonious solutions. These are the logical remainders of the solution. Using the Specify analysis will lead to different outputs. The standard analysis is preferred however. The table below shows the output for the standard analyses.

Insert

Figure 6 about here

According to Ragin (2008b), the solution is here that weak class voting is a product of the high membership in the set of affluent countries and weak membership in strong unions.

FsQCA offers as well the possibility to show descriptive statistics, frequency analysis and cross-tab results. Below is the result for the fsQCA outcome of weak class voting shown as descriptive stats.

Insert

Figure 7 about here

5 Conclusion

The explanation, presentation and discussion of fsQCA for management and business research offers a tool which benefits this field of research to generate qualitative results and transfer these into rigorous quantitative findings. This chapter emphasises the relevance of this methodology and shows its applicability to real-life problems in a complex field such as business and management. The literature review therefore provides an insightful overview

regarding the use of fsQCA. We hope that business and management scholars will follow up on the opportunities offered by this methodology. A good starting point is the literature offered by Ragin and colleagues, in terms of empirical application, the software offered as a free download at the University of Arizona, will prove invaluable.

This chapter highlights the possibility for researchers to see their qualitative results transferred into a quantitative framework. This allows the findings to be communicated differently, which will be appealing to quantitatively trained audiences. Organisational business questions are looking into asymmetrical relationships which coincide with real-life applications and the strength of fsQCA to provide answers in that respect. Regression analysis results, which have been used so far in management research and provide a symmetric solution to asymmetrical problems, can now be complemented with fsQCA findings.

The practical example in this chapter follows a step-by-step approach from data collection, calibration, truth table analysis to the necessary and sufficient conditions of the outcome. The researcher can also add descriptive statistics, which enable qualitative data to be shown in an equivalent manner to quantitative results.

This chapter argues that fsQCA offers qualitative research a tool which gives rigorous insights into problems, which consider the classification and analysis of actions and behaviour as well as the provision of equifinal solutions where many paths can lead to an outcome. The in-depth analysis of case-oriented research combined with rigour benefits the research questions of managerial phenomena.

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7 Appendix – Tables and figures

Figure 1: The use of fsQCA in management research (Seny Kan et al. 2016)

Table 1: Recent business papers using fsQCA (organisational, entrepreneurial and firm performance topics)

Business paper	Journal	Topic	Approach	Level of analysis
Coduras, Clemente and Ruiz (2016)	Journal of Business	Global Entrepreneurship	Entrepreneurial attitudes and social values	Global Entrepreneurship

	Research		of adult populations toward entrepreneurship.	Monitor data.
Beynon, Jones and Pickernell (2016)	Journal of Business Research	Entrepreneurship	Relationship between entrepreneurial attitudes and activity.	cross-country comparison
Chaparro-Peláez, Agudo-Peregrina and Pascual-Miguel (2016)	Journal of Business Research	Drivers and inhibitors of e-commerce adoption. from a	Electronic commerce behavior	
Jenson, Leith, Doyle, West, and Miles (2016)	Journal of Business Research	innovation system failure	innovation systems theory	multiple case study
Kuckertz, Berger, andMpeqa (2016)	Journal of Business Research	entrepreneurial activity in the application to	factor-driven, efficiency-driven, and innovation-driven economies	
Domenech, Escamilla, and Roig-Tierno (2016)	Journal of Business Research	Knowledge-intensive activities from a regional	causal model to explain how these factors affect knowledge-intensive activities	
Leischnig and Kasper-Brauer (2016)	Journal of Business Research	Firm profitability	Selling	a two-level approach to industry factors and selling factors
Muñoz and Kibler (2016)	Journal of Business Research	Social entrepreneurship. institutional complexity of social entrepreneurship and explain under which	Institutional Theory	combinations of local institutional forces social entrepreneurs build opportunity confidence.
Lisboa, Skarmas, and Saridakis (2016)	Journal of Business Research	Entrepreneurship	entrepreneurial orientation towards firm performance	causal mechanisms by which those factors collectively affect performance.
Ospina Delgado and Zorio Grima (2016)	Journal of Business Research	innovation at universities.	complex cause–effect relationship between innovation and the supply of university courses	
Wang, Yu, and Chiang (2016)	Journal of Business Research	Value relevance of corporate reputation	Corporate reputation	Taiwan
Wang, Yu, and	Journal	Manager's	Export decisions.	corporate

Chiang (2016)	of Business Research	educational background and ICT		
Benavides Espinosa and Merigo Lindahl (2016)	Journal of Business Research	Organizational design as a learning enabler	different design variables and their effect on organizational learning.	
Wu (2016)	Journal of Business Research	International marketing strategy modeling of leisure farm.	international marketing strategies, and performance	leisure farm context.
Simón-Moya and Revuelto-Taboada (2016)	Journal of Business Research	Revising the predictive capability of business plan quality for new firm survival	between business plan quality and survival rates of new ventures	
Cobo-Benita, Rodríguez-Segura, Ortiz-Marcos, and Ballesteros-Sánchez (2016)	Journal of Business Research	Innovation projects performance	organizational theory	large sample of firms in Spain appearing in the Community Innovation survey
Bergmann, Stechemeser, and Guenther (2016)	Journal of Business Research	Financial performance and natural resource dependence theory.	natural resource dependence theory	
Lassala, Carmona, and Momparler (2016)	Journal of Business Research	Alternative paths to high consulting fees	customer satisfaction	
Felício, Duarte, and Rodrigues (2016)	Journal of Business Research	Global mindset to SME internationalization.	SMEs' internationalization behavior	relationship between IGM and CGM.
Adame, Caplliure, and Miquel (2016)	Journal of Business Research	women's presence in the workplace	work-life balance policies	
Urueña and Hidalgo (2016)	Journal of Business Research	loyalty in e-complaints.	customer loyalty.	a sample of e-commerce users who file complaints after shopping online,
Alegre, Mas-Machuca, and Berbegal-Mirabent (2016)	Journal of Business Research	Employee job satisfaction.	(1) teamwork, (2) employeework–family balance, and (3) supervisor support and identification with the strategy.	
Whittington and Bell (2016)	Journal of Business Research	Employee performance, commitment and citizenship behaviors.	Leadership and motivational constructs	
Pinazo-Dallenbach,	Journal	Entrepreneurship	Entrepreneurial	high-potential

Mas-Tur, and Lloria (2016)	of Business Research		characteristics (i.e. education, gender, motivation, and age) and environmental variables (i.e. citizen insecurity)	firms
Comeig, Grau-Grau, Jaramillo-Gutiérrez, and Ramírez (2016)	Journal of Business Research	Relationship with competition preferences and the different paths that may lead to enter competition.	Entry Strategy	
Bigné, Llinares, and Torrecilla (2016)	Journal of Business Research	Consumer choice, customer experience, and shopping behavior in a store – virtual reality	Customer behaviour, Neuroscience	virtual reality-based study
Fiss, Frambach, and Ingenbleek	Journal of Business Research	Customer orientation and superior firm performance	Configurational, strategic orientations, strategy types, and market conditions	
Kulins, Leonardy, and Weber (2016)	Journal of Business Research	Relationship between business model, design, and financial performance.	Configurational	
Romero, Lafont, Tafur, and Eguren (2016)	Journal of Business Research	Performance and value creation at United Kingdom's airports .	Governance, revenue structure, airlines, passengers, and strategy	
Berbegal-Mirabent and Llopis-Albert	Journal of Business Research	Driving forces in collaborative research contracts of science-industry R&D partnerships.	human capital experience, the profile, and the capacity attraction affect the performance	
González-Cruz and Cruz-Ros (2016)	Journal of Business Research	Family involvement produce superior performance in SME family business	SME family businesses.	
Seny Kan, Adegbite, El Omari, and Abdellatif (2016)	Journal of Business Research	Comprehensive review of the uses of QCA in the field of management research.	Organizing the field, the study identifies current management issues of interest.	
Nair and Gibbert (2016)	Journal of Business Research	Analyzing inconsistent cases in management fsQCA studies	Theory-building of deviant cases	
Ferreira, Jalali, and Ferreira (2016)	Journal of Business Research	Fuzzy cognitive maps (FCMs) serve as support in the selection of independent variables	specific FCM to integrate in the QCA guidelines.	
Fotiadis, Yeh, and Huan (2016)	Journal of Business	Rural tourism success recipes	Configurational analysis, collaborative	

	Research		skills	
Gonçalves, Lourenço, and Silva (2016)	Journal of Business Research	Consumption values predict green buying behavior.	Emotional, conditional, and social values to predict the buying green behavior	
Hernández-García, Iglesias-Prada, and Fernández-Cardador (2016)	Journal of Business Research	Causal recipes for acceptance and refusal of corporate blogs	Sharing knowledge in the organization	
Hernández-Perlines, Moreno-García, and Yáñez-Araque (2016)	Journal of Business Research	Absorption capacity in the training process that can increase the performance of organizations.	Absorptive capacity	
Pu Hai, Roig-Dobón and Sánchez-García (2016)	Journal of Business Research	Public policy for innovative governance.	Innovation	
Jacobs, Cambré, Huysentruyt, and Schramme (2016)	Journal of Business Research	Success in the fashion Industry and dominant logic, organizational life cycle,	Concepts of organizational life cycle	
Ott and Kimura (2016)	Journal of Business Research	Negotiations in Japanese Multinational Enterprises	Bargaining theory	Firm-level
Fan et al. (2016)	International Business Review	The factors that influence localised learning by Chinese multinationals who have made FDI in Australia	Dynamic capability	Firm-level
López-Duarte, Vidal-Suárez, and González-Díaz (2015)	Cross Cultural Management	Study the influence of cultural positions on the choice of entry mode in foreign direct investment (FDI)	Cultural Distance Paradox	Country-level
Marchi et al. (2014)	European Journal of Marketing	Examining the factors that influence the international market decision making process of small firms	Behaviour-based international market decision making process	Country-level and Firm-level
Greckhamer (2011)	Organizational Studies	Investigates whether combinations of cultural and macro-environmental attributes are associated with differences in compensation level and compensation inequality in different countries	Compensation and culture	Country-level
Crilly (2011)	Journal of International Business Studies	Investigates the conditions under which overseas subsidiaries accept a shareholder-centric approach as against a stakeholder-centric approach to management	Stakeholder orientation	Firm-level
Fiss (2011)	AMJ	Organizational Theory and configurations	Organization Theory	

Kvist (2007)	JBR	Configurational Approach in Business Research	Organization Theory	
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Figure 2: FsQCA Data sheet after Calibration in csv

The screenshot shows a software window titled "FS/QCA Data Sheet" with a menu bar (File, Variables, Cases, Analyze, Graphs) and a table of 12 cases. The table has columns for Case, name, gdpf, inqf, manf, unf, and weakcv. The data is as follows:

Case	name	gdpf	inqf	manf	unf	weakcv
1	AUS	0.9	0.7	0.3	0.7	0.7
2	BEL	0.7	0.1	0.1	0.9	0.7
3	DEN	0.7	0.3	0.1	0.9	0.1
4	FRA	0.7	0.9	0.1	0.1	0.9
5	GER	0.7	0.9	0.3	0.3	0.7
6	IRE	0.1	0.7	0.9	0.7	0.9
7	ITA	0.3	0.9	0.1	0.7	0.7
8	NET	0.7	0.3	0.1	0.3	0.9
9	NOR	0.7	0.3	0.7	0.9	0.1
10	SWE	0.9	0.3	0.9	1	0
11	UKN	0.7	0.7	0.9	0.7	0.3
12	USA	1	0.9	0.3	0.1	1

At the bottom of the window, the file path is shown as "File: CV1379.CSV".

Figure 3: Selection of conditions

The screenshot shows a "Select Variables" dialog box. It has two main sections: "Variables" on the left and "Outcome" and "Causal Conditions" on the right. The "Variables" list contains: gdpf, inqf, manf, unf, and weakcv. There are two arrows pointing from the "Variables" list to the "Outcome" and "Causal Conditions" boxes. At the bottom, there are three buttons: "Reset", "Cancel", and "Run".

Figure 4: Truth table

gdpf	inqf	manf	unf	number	weakcv	consist	pre	product
1	1	0	0	3 (25%)		0.950000	0.909091	0.863636
1	0	0	1	2 (41%)		0.736842	0.523810	0.385965
1	0	1	1	2 (58%)		0.666667	0.333333	0.222222
0	1	0	1	1 (66%)		0.764706	0.529412	0.404844
0	1	1	1	1 (75%)		0.812500	0.571429	0.464286
1	0	0	0	1 (83%)		0.928571	0.833333	0.773809
1	1	0	1	1 (91%)		0.789474	0.600000	0.473684
1	1	1	1	1 (100%)		0.722222	0.411765	0.297386
0	0	0	0	0 (100%)		0.909091	0.714286	0.649351
0	0	0	1	0 (100%)		0.733333	0.428571	0.314286
0	0	1	0	0 (100%)		0.916667	0.714286	0.654762
0	0	1	1	0 (100%)		0.785714	0.454546	0.357143
0	1	0	0	0 (100%)		0.928571	0.818182	0.759740

Specify Analysis Cancel Standard Analyses

Figure 5: Truth table

gdpf	inqf	manf	unf	number	weakcv	consist	pre	product
1	1	0	0	3	1	0.950000	0.909091	0.863636
1	0	0	0	1	1	0.928571	0.833333	0.773809
0	1	1	1	1	0	0.812500	0.571429	0.464286
1	1	0	1	1	0	0.789474	0.600000	0.473684
0	1	0	1	1	0	0.764706	0.529412	0.404844
1	0	0	1	2	0	0.736842	0.523810	0.385965
1	1	1	1	1	0	0.722222	0.411765	0.297386
1	0	1	1	2	0	0.666667	0.333333	0.222222

Specify Analysis Cancel Standard Analyses

Figure 6: Truth table analysis

```

fs/QCA
File Analyze Graphs Window Help

*****
*TRUTH TABLE ANALYSIS*
*****

File: C:/Documents and Settings/Sarah/Desktop/Weak_CV.csv
Model: WEAKCV = f(GDPF, INQF, MANF, UNF)

Rows:      10

Algorithm: Quine-McCluskey
  True: 1 |
  0 Matrix: 0
Don't Care: -

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1.000000
consistency cutoff: 0.928571
Assumptions:
GDPF (present)
INQF (present)
MANF (present)
UNF (present)

      raw      unique
      coverage  coverage  consistency
-----
GDPF*unf    0.619718    0.619718    0.956522
solution coverage: 0.619718
solution consistency: 0.956522

```

Figure 7: Descriptive statistics

The screenshot shows a software window titled '74fs/QCA' with a menu bar containing 'File', 'Analyze', 'Graphs', 'Window', and 'Help'. The main content area displays the title 'weak-class-vot.dat: Descriptive Statistics' followed by a table of statistical data for five variables: gdpf, inqf, manf, unf, and weakcv. Each row in the table provides the Mean, Std. Dev., Minimum, Maximum, N, and Cases Missing for that variable.

Variable	Mean	Std. Dev.	Minimum	Maximum	N	Cases Missing
gdpf	0.675	0.2384848	0.1	1	12	0
inqf	0.5833333	0.2881936	0.1	0.9	12	0
manf	0.4	0.3316625	0.1	0.9	12	0
unf	0.6083333	0.3094574	0.1	1	12	0
weakcv	0.5666667	0.3399346	0	1	12	0