The Continuing Problem of Organization Size in the Business Literature

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A number of disciplines pursue research into organizations. This organizational research serves to improve knowledge regarding the interaction, behaviour and direction of humans and groups. Organisational size, as a construct, has received considerable application but little critical examination. However, despite the magnitude of the problem, there have been few studies that have explicitly shown the problem. This study examines prior work in the business literature in order to document and classify how organization size is used and understood. The findings raise a number of issues that are out of the scope of this study. These issues merit further research.

Introduction

Divergence can occur in cases where the relationship between a real world phenomenon and a construct is not easily observable. Divergence may also occur when the relationship between the construct and its indicators is unclear or erroneous. Consequently, disagreement may persist in studies that employ the construct in the research literature. This study applies this argument to the case of organisational size by examining the extent of the problem and past solutions.

This study presents evidence from the research literature where authors have used organisational size and presented contradictory findings in their own studies. Second, evidence is presented from prior research literature in which authors have identified the problem in earlier studies. This evidence is gathered from the literature in information systems and other disciplines in order to illustrate how this inconsistency has persisted over time and over a range of research areas.

The goal of this study is threefold. First, it aims to illustrate the contradictory ways in which authors in the research literature have treated both the size construct and its indicators. Second, it aims to describe what researchers already know about size. Third, it aims to show how researchers have already approached the problem in order to give some direction for research method development in this area.

This paper is structured as follows. The paper first presents an overview of the problem of size inconsistency. Then, the study presents two sets of evidence: research inconsistency from the literature, and argument from researchers regarding the inconsistency. Finally, the study discusses previous attempts to solve the problem.

Size Inconsistency in the Research Literature

Theoretical multiplicity is common in many disciplines. For example, authors in domains such as accounting (Watts and Zimmerman 1979), science (Cat 1995) and empirical finance (Fama 1965) have thoroughly documented (and, at times, vigorously defended) competing theories in their respective disciplines. This diversity, however, can mean that competing and conflicting theories exist for the analysis and understanding of a given phenomenon. Consider, for example, the many approaches in information systems to comparing system development success (Olle et al. 1988), quantifying software engineering productivity (Fenton and Neil 1999) or frameworks for analysing strategic information systems implementation (Lee and Adams 1990). While circumstances such as this may not be uncommon in scholarly environments, competition between theories and methods can serve to undermine the validity, reliability and comparability of scholarly analysis and the practical application of research. In general, the steady resolution of such conflict benefits both practitioners and researchers alike.

Amid the many variables that researchers employ in their work, organisational size is of particular importance (Kapur 1995, Dong and Saha 1998, Hausdorf and Duncan 2004). Many have observed it as an important independent variable in the analysis of organisations and technology (Eisele 1974). While researchers persist in using organisational size as a component of their research, its application continues to deliver inconclusive results. Occasionally, this is due to disagreement about size in terms of its meaning as a construct. In other cases, inconsistency arises because of disagreement regarding the construct's measurement (its indicators). Clearly, organisational size deserves sober reassessment.

This paper presents evidence that this inconsistency extends to studies in the published research literature. This section is divided into two categories. First, the section presents a list of studies that have obtained conflicting results when using organisational size. Second, the section presents the observations of researchers which, when considered collectively, suggest significant inter-subjective disagreement with respect to the size construct.

Inconsistent Comments About the Size Construct

Disagreement is apparent in the literature when reading what researchers think the organisational size construct *means*. One approach to exploring what size means is to consider how authors define size. However, many papers do not discuss what size means at all and, instead, size is frequently defined in terms of how it could be measured. For instance, Gupta (1980), wrote, "the 'size effect' has plagued researchers for decades, perhaps because most discussions have adopted a uniform definition of organisational size, namely, the number of members".

Within this definitional discussion, there is some variance. Temtime (2003:55) observed that the "definition of firm size varies, not only from one economy to another, but also from industry to industry within the same economy". Similarly, Banz (1981:161) wrote, "We do not even know whether the factor is size itself or whether size is just a proxy for one or more true but unknown factors correlated with size".

The following comments from the literature illustrate the persistent confusion between the meaning or definition of organisation size and its measurement:

> *"Although no formal definition of firm size exists, most people would define it in terms of a firm's current assets." (Berk 1997)*

> *"Firm size is defined as the number of subscribers who receive the bills from a firm." (Kim 2002)*

> *"Organisational size is defined as the number of employees at any given geographical location." (Beer 1964)*

> *"A firm's size was defined as its relative size: [the] firm's market value [divided by] the mean of beginning-of-year market values of all firms in the COMPUSTAT industrial annual tape." (Chung et al. 1996)*

> *"For the purpose of this study, organization size will be defined by the number of blue-collar employees at a particular manufacturing plant who were covered by one or more labor-management agreements in 1970." (Eisele 1974)*

Talacchi (1960:400) indirectly offered an explanation for this confusion, arguing that "studies in this area have dealt with the variable of size only peripherally because relevant data were collected and analysed incident to some other objective, such as the study of the relationship between morale and behaviour of employees". This suggests that perhaps authors have been more concerned about using size as a construct to predict relationships with other phenomena, rather than exploring size as a phenomenon itself.

Further, the use and discussion of size as a construct may form the basis of many other studies as researchers pursue the important task of reviewing the literature in the natural progression of scientific research. This debate impedes the progression of scientific enquiry as other researchers then seek to replicate these works. This inconsistency is perhaps due to the contention that researchers each have a tacit understanding of size which is not necessarily congruent across authors. Individual researchers, themselves, may each understand and be able to justify their use of the organisational size construct, however this understanding is not generally accepted or congruent across authors.

The absence of definitional discussion in the literature may partially explain the problem of size inconsistency: authors may have difficulty describing the construct's meaning and this means they cannot agree on how to measure it.

Inconsistent Comments About Size Indicators

Disagreement can also be observed when reading literature discussion about the construct's indicators. Each comment below was taken from a blind peer-reviewed published research paper in a journal of good academic standing. That is, these comments have survived both the peer review process and the editorial process without severe modification. When viewed in aggregate, these comments clearly suggest disagreement and inconsistency. However, when each is read in its own individual context, *in situ*, the comments do not appear to be in conflict. These comments follow:

> *"Number of employees is the most common size criterion used by researchers." (Choe 1996)*

"Common operationalisations of firm size include gross sales or gross value of assets." (Karimi and Gupta 1996)

"We measured firm size as number of employees since sales and assets were used to compute performance measures." (Baucus and Baucus 1997)

"Most students of organisational structure have taken the number of employees as the main referent of size." (Child 1973)

"Size...was measured by the number of beds devoted solely to inpatient psychiatric care. This measure...represents a common classification of size in previous research." (Hrebiniak and Alutto 1973)

"The number of persons under the respondent's direction is probably a good approximate measure of the size of the organisation." (Kriesberg 1962)

"The [Private Companies Practice Section] files contain several measures of audit firm size: number of CPAs, number of partners, and total staff." (Colbert and Murray 1999)

"Total assets are commonly used to measure firm size." (Carpenter and Petersen 2002)

"The best indicator for size is the firm's total sales volume." (Ali and Swiercz 1991)

"Number of personnel is the most widely used indicator." (Price and Mueller 1986)

"Commonly used criteria for defining a small business include number of employees, annual sales, fixed assets." (Thong and Yap 1994)

"Companies were identified...by listings of those that employed graduates on a regular basis, as this was felt to be an indicator of size." (Coakes and Merchant 1996)

"The simplest and most adequate way of arranging organisations by size is to count their members." (Caplow 1957)

"The...organisations are of similar size in terms of the total number of users their information architectures support." (Nezlek et al. 1999)

"We used the Department of Transportation's dichotomous [Large or Small] classification, which has been widely used as a key demarcation in airline industry research." (Chen and Hambrick 1995)

> *"The smallest organisations have two members, this being the least number capable of maintaining an interaction system." (Caplow 1957)*

> *"Certainly one measure of firm size can be the total number of employees [however] typically, other measures such as stock market value of the firm, profits, or total assets are used to measure firm size." (Hallock 1998)*

> *"Several indicators have been employed in the literature to measure firm size. The most popular are the number of full-time employees and sales volume." (Katsikeas and Morgan 1994)*

> *"Variables used to measure firm size include total premium, total admitted assets, and capital and surplus." (Chen and Wong 2004)*

The evidence presented above illustrates the inconsistency with which authors approach the understanding or measurement of organisational size. When each comment is considered in isolation, the statement appears acceptable. However, when examined collectively, the inconsistency between statements becomes apparent. For example, while comments by Price and Mueller (1986) and Choe (1996) are similar, the statements by Choe (1996) and Berk (1997) appear contradictory. Contrary to Indik's (1964) claim that the "organisational unit size [is] relatively easy to measure", there appears to be much disagreement in the literature about how this should be done.

Orlitzky (2001) presented an alternative perspective on this issue. Orlitzky conducted a meta-analysis of research into corporate social performance and argued, "Operationalisations of firm size...differed from one study to the next. Multiple operation is, however, not a problem, but a strength. Positive correlations between different operationalisations (e.g., amount of sales revenue and number of employees in the case of firm size) indicate the measurement of the same underlying construct and do not impair the validity of the meta-analysis" (p. 172).

The previous study argued that indicators for a given construct should possess content and convergent validity. The evidence presented above suggests that treatment of the size construct lacks these aspects of validity in that repeated use of the size construct does not appear to yield convergent results and the associated indicators also do not measure the qualities that they purport to measure (Thorndike and Hagen 1969).

Inconsistent Research Findings Involving Size

Table 1 shows a list of studies taken from the organisation, management and information systems literatures. These empirical studies have provided inconsistent results when using the organisational size construct as an independent variable. The studies in this section were identified by reading journal articles and conducting keyword searches. The study does not hold the list of dependent variables to be exhaustive. However, the list does give the reader an indication of the extent of the problem. For each dependent variable, Table 1 gives one or more studies in which size (as a construct) was found to have an effect, and similarly one or more studies in which the size construct was found not to have an effect.

Table 1.Literature Findings For Organisational Size as an Independent Variable

Dependent Variable	Size is Positively Significant	Size is Not or Negatively Significant
Degree of bureaucratisation	Chapin (1951), Tsouderos (1955)	Hall (1963)
Administration overhead	Terrien and Mills (1955)	Anderson and Warkov (1961), Bendix (1956)
Complexity and structure	Caplow (1957), Grusky (1961), Blau (1970), Meyer (1972)	Blau and Scott (1962), Zelditch and Hopkins (1961)
Innovation adoption	Aiken and Hage (1971), Corwin (1972)	Mohr (1969)
Hardware centralisation	Ein-Dor and Segev (1982)	Olson and Chervany (1980)
Technology use	Hickson et al. (1969)	Woodward (1965)
Economies of ccale	Coates and Updegraff (1973)	Klatzky (1970)
Level of technology use	Yao et al. (2002)	Goss and Vozikis (1994)
Export activity	Kaynak and Kothari (1984), Lall and Kumar (1981)	Ali and Swiercz (1991)
Corporate social performance	Chen and Metcalfe (1980)	Orlitzky (2001)
IS planning	McFarlan et al. (1983)	Premkumar and King (1994)
Innovation	Nord and Tucker (1987)	Aldrich and Auster (1986)
IS use	Lehman (1986)	Gremillion (1984)
IS adoption	Moch and Morse (1977)	Globerman (1975)
Website use	Lin (2002)	Goode and Stevens (2000)
Firm productivity	Herbst (1957)	Marriot (1949), Thomas (1959)
Export ability	Cavusgil and Nevin (1981), Christensen et al. (1987)	Edfelt (1986), Holden (1986)
Trade intensity	O'Rourke (1985)	Bilkey (1978)
Audit disclosure	Singhvi and Desai (1971)	Wallace et al. (1994)
Workplace satisfaction	Marsden et al. (1996)	MacDermid et al. (1999)
Dynamic innovation	Methe (1992)	Stock et al. (2002)

The papers in Table 1 point to a number of important issues. First, whereas some studies disclosed their indicator for size, all papers referred to size *at the construct level* (i.e. its meaning). However, the evidence presented in Table 1 suggests that disagreement may result at both the construct and indicator levels. Over time, this disagreement manifests itself in terms of disagreement about size *as a phenomenon* (i.e. its theory). Studies on a variety of topics have delivered inconsistent results when using the construct. The range of topics is substantial and the list of topic areas shows no obvious thread of similarity. The list includes example studies of organisational structure, organisational behaviour as well as technological innovation. This inconsistency may extend to other topic areas which are not included in this table. The magnitude of this effect is, as a result, a matter of conjecture. Because so few studies have adequately explored the reasons for this disagreement, researchers are unsure about whether the problem of organisational size is

due to its measurement, its meaning, or its theory. These problems need to be disentangled.

The second point to note is that this problem has been present for some time. Studies in Table 1 were published between 1951 and 2002. This time span suggests that either researchers have not yet observed or recognised the problem, or that few solutions to the problem have been proposed and subsequently acted upon. With respect to the organisational size construct itself, there appears to be very little evidence of research progression or accumulation.

The main implication of these issues for theory building is that construct disagreement may result in poor theory and, in turn, poor knowledge. Persistent use of the size construct in this regard may mean that researchers increasingly find themselves unable to base their research on reliable evidence. This may result in an inability to build the research pedigree, as observed in Study 2.

The Recognition of Size Inconsistency in the Research Literature

This section establishes that some authors in the general organisational research literature have encountered the inconsistency of organisational size. Several researchers in the broader organisational literature have spent considerable effort analysing the organisational size construct. Most of these studies, such as Robey et al. (1977), Haveman (1993), and Damanpour (1996) have focused on how the size construct has been used in the literature. However, few studies have explored the size inconsistency problem *per se*. This discussion presents an analysis of the work that has recognised the inconsistency of organisational size.

Early studies involving organisational size (such as Hamilton 1921, Walters 1931, Durkheim 1947 and Warner and Low 1947) focused mainly on structure and administration, in areas such as plant economics and sociology (Tyler 1986). Pugh et al. (1969:97), also citing Porter and Lawler (1965), wrote "there has been much work relating size to group and individual variables…with not very consistent results". At a similar time, Hall and Weiss (1967:319) observed that "previous studies of the effect of size on profitability...have provided only very imperfect information on the subject". Frustratingly, Hall et al. (1967) were critical of the overly simple treatment of size in the literature, but then measured the organisational size construct with a single unidimensional indicator themselves: "determination of organisational size for this study was quite simple. The total number of paid employees in an organisation was taken as an accurate measure of size" (p. 905).

Coates and Updegraff (1973) later observed the conflict between Caplow's (1957) assertion, that firm administrative overhead increases as firm size increases, and evidence from Blau and Scott (1982) and Melman (1951) to the contrary. Murphy (1976) subsequently criticised the Coates and Updegraff study, partly on the grounds of its erroneous handling of size. Robey et al. (1977) wrote, "conclusions regarding size range from Hall's (1972) virtual dismissal of its importance *vis-à-vis* other causal factors to Meyer's (1972) claim that size explains virtually all of the observed variation in structure". This is reflected, to some extent, in the words of Kimberley (1976:575), "in many ways, [size] explained everything and nothing at the same time".

Paulson (1980) and then Dalton and Kesner (1983) later witnessed the "controversy regarding the appropriateness, dimensionality, and psychometric properties of common size metrics", also citing Gupta (1980). Banz (1981:161) wrote, "we do not even know whether the factor is size itself or whether size is just a proxy for one or more true but unknown factors correlated with size". Sutton and D'aunno (1989) observed differences and conflict between the sociological view of size (which focuses on structural features of an organisation) and the 'psychological' view of size (which focuses on an organisation's behavioural factors). These authors also observe that completely contradictory hypotheses can be developed using these two perspectives.

Bonaccorsi (1992) conducted a review of the literature on export and trade with regard to size and noted, "all authors state that empirical findings on the relationships between firm size and export behaviour are mixed or conflicting" (p. 606). The authors subsequently attributed this to "conceptual shortcomings of current export research" (p. 631). Aaby and Slater (1989) made similar observations. Simon (1997:109) also sees the problem: "it should be noted, however, that the size variable is unusual in that it suggests differences in the 'nature' of two firms, or of the same firm at different moments, whereas the only difference between firms found in standard theory is a difference in cost functions".

Authors in domains other than those that focus on business analysis have also recognised inter-study inconsistency. Consider the recent arguments of Barber et al. (1999:844) writing in the psychology literature:

> *"...integration of results from these empirical studies is made difficult by the fact that...firm size is categorised differently across studies. For Pritchard and Fidler (1993) and Deshpande and Golhar (1994), firms with fewer than 500 employees are classified as 'small', a classification consistent with the standards of the Small Business Administration. But Bertram et al. (1995) included only firms with fewer than 25 employees as 'small', Heneman and Berkley defined firms with less than 100 employees as 'small', and Marsden's (1994) 'large' category included firms with more than 250 employees."*

Similarly, Dalton et al. (1980:51), in the administrative science literature, wrote:

> *"Measurement can also be problematic...Hrebiniak and Alutto, for instance, used number of beds as an indication of organisation size, a common practice in differentiating hospitals. Bidwell and Kasarda used average daily student attendance, an accepted criterion of school size. Reimann counted the number of full-time employees. Each method is reasonable; comparison of these studies is complicated, however because the measures are neither identical nor interchangeable. Moreover, Reimann, and Bidwell and Kasarda used a logarithmic conversion to normalise size. The others do not do so. Again, this makes responsible comparison difficult".*

Finally, comments from Lee and Smith (1995:245) in the education literature are also relevant:

> *"Findings about the effects of school size have been inconsistent because of weaknesses in the research: inconsistent definitions, inappropriate methodology,*

> *and (primarily) an unclear focus about what may be affected by a change in school size and on the process through which those effects may work."*

Within the information systems discipline, there has been little recognition of size inconsistency. Mabert et al. (2003:236) observed that "organizational size is the most frequently examined structural variable and has been used to study issues relating to innovation, R & D expenditures and market power". The size construct continues to receive application in the information systems literature, particularly in the context of technology adoption (Swanson 1994). Yet, Yao et al. (2002:80) warned that "using size as a variable without careful classification may not yield desirable results". Similarly Bajwa and Lewis (2003:32) wrote,

> *"While some innovation studies suggest a positive relationship between organization size and adoption behaviour...a negative relationship between size and adoption behavior has also been observed. In summary, past studies have yielded mixed results on the relationship between organization size and adoption behaviour".*

One example of the few studies to acknowledge this inconsistency in the information systems literature comes from Choe (1996:216):

> *"In terms of organization size, Gremillion has suggested no relationship between IS use and organizational size as measured by geographic area, staff and budget levels, and so on. However, Yap empirically suggested a positive relation between IS use and organization size measured by annual turnover. The results of the two studies were contradictory. Raymond explained these conflicting results through system sophistication. He reported that the effect of organization size on IS usage is mediated by the system sophistication."*

The evidence presented above shows that at least some authors in the published research literature have noticed the problem of disagreement with respect to constructs, indicators or both. This disagreement has persisted for some time. There has, however, been seemingly little recognition of the problem in the information systems literature. Given the importance of organisational research and analysis in information systems, this is a significant problem.

Possible Explanations

The argument presented in this study, based on the evidence presented above, is that the research discrepancy may be due to construct error. In other words, this study argues that organisational size as a construct is improperly treated and measured. It is possible, however, that this inconsistency could be explained through other means. This section considers some of these alternative propositions.

The Effect of Differences Between Organisations

It could be argued that the studies cited in the previous section are exploring organisations which are fundamentally different to each other. Each study is examining organisations which exhibit different contextual properties. These differences in context at least partially explain the variance in research findings. If true, this would suggest that

such firms should be compared only in particular circumstances and disregarding these differences might lead to unreliable analysis. This argument would be consistent with Kimberley's (1975, 1976) observations that significant structural differences can exist between tribes and other social groups. Kimberly's arguments may extend to commercial organisations also.

However, it could also be argued that, despite this contention, other studies in the literature do not distinguish between different types of organisation either. Little mention is made of contextual organisational differences in these studies and firms are compared without regard for such contingencies. The effect of this problem may be large, but the issue has been largely ignored in the research literature itself.

The Effect of Measurement Error

The discrepancies presented in the previous section could be attributed to measurement error. That is, the data used in the studies presented in the previous sections are affected by inconsistency, bias or exaggeration. These problems may affect the statistical analysis, leading to erroneous and conflicting results. Differing research methodologies used may also reduce comparability between studies (Calof 1993). This error may not necessarily be systematic, nor need it be predictable or obvious. If the size construct was merely unpredictable or unsystematic, the solution to the size problem would be straightforward: researchers could discontinue the size construct's use in empirical research and subsequently seek out a more reliable construct.

However, the existence of such error is an unsatisfying explanation of the problem. It is unlikely (although admittedly possible) that this error would be so widespread among researchers in different countries and with different datasets. Additionally, if such error is to blame for this inconsistency, then constructs other than organisational size could conceivably also be subject to the problem. Also, in some cases, authors *do* use more than one indicator for size and observe distinct similarity among research hypostudy outcomes (as in Carpenter and Fredrickson 2001). Given the tremendous amount of work undertaken in these studies, data error of such magnitude seems implausible. For the purposes of this study, such error will be deemed negligible.

The Effect of Differences Between Industries

The evidence presented so far could be attributed to industry differences, whereby the structural effects of organisations in different sectors cloud the results. For instance, organisations in the mining or manufacturing sectors may be human resource rich, while firms in investment or banking sectors may rely more on financial resources (Cardinal et al. 2001). Paulson (1980) observed that governmental organisations may exhibit yet more differences and also notes that industry may be a limiting factor in size studies in this regard. If this is the case, then a given approach to measuring organisational size may yield different results when conducted in different industries. Given these differences, the most appropriate indicator for measuring organisational size would depend on that organisation's particular industry.

However, authors in the literature themselves frequently do not restrict or divide their data samples with respect to industry. While some studies do clearly narrow analysis to particular industries (such as Robey et al. 1977), studies such as Bannerjee and Golhar (1994) and Teo et al (1997) treated the multi-sector firms in their samples as

homogeneous groups. Koberg et al. (1996) did not distinguish between industries but declared that their results may not be generalisable across firms in other industries. Sambamurthy and Zmud (1999), conducting case study analysis of a small group of firms, acknowledged the diversity of industry types but make no obvious distinction in terms of industry thereafter. Ein-Dor and Segev (1982) recognised inter-item correlation and an industry effect as a limitation to their findings. Damanpour (1996) also observed industry effects in his data set but did not control for them in any testing involving organisational size.

The implication of this is that sector differences may have an effect on research outcomes, however not all studies take this into account. The handling of industry and sector types has itself been somewhat inconsistent across research studies.

Prior Attempts to Solve the Problem

The purpose of this section is to clearly set out what has been done to explore and address the problem of size inconsistency. Many studies in the general organisational literature which have encountered the problem of size inconsistency do not explore it in sufficient depth to offer a solution. The literature shows very few studies that have actually attempted to *solve* the problem of organisational size construct inconsistency. These studies are explored in greater detail below. Discussion of each study will make specific notes on the paper's approach, findings and their implications for this study.

Caplow (1957)

Caplow's work in the organisational theory literature was among the first to critically examine organisational size. Caplow made a number of theoretical arguments and observations regarding size and, as such, his work merits inclusion here. Caplow did not so much attempt to solve the inconsistency of size measurement and use, but rather attempted to organise some of the literature understanding of size itself.

Caplow's work focused predominantly on social organisations and groups of humans. In particular, Caplow discussed the substantial alignment between social and organisational groups (such as tribes and families). First, Caplow discussed different categories of size, developing *a priori* classifications and descriptions of small, medium, large and giant organisations. Small organisations could range in size up to "about one hundred members" and still allow each person to interact with each other person. Medium organisations were already too large to afford inter-personal communications between each pair of members, possessing an "upper limit of perhaps one thousand members". The 'large' and 'giant' organisations have so many members that certain members may know one member, but none can know every member.

Caplow's second argument was that organisational complexity was closely related to size. Caplow divided his discussion of complexity into four types. He first observed pair interactivity, where a group's member has a communication relationship to another member of the organisation. The next category involves pair relationships and group relationships held by one member of the original pair. The third type concerns relationships between groups of organisational members. The fourth category contains all groups and individual relationships in the other three categories combined.

Caplow's work has three important implications that are relevant to this study. First, Caplow arguably treated size as a "first-order construct". He argued that the size of a social group should be related to and measured by the number of its members. This argument may explain why later researchers have attempted to also treat size as a first-order construct, using different indicators, with little success and substantial disagreement.

Second, Caplow focused on social organisations (such as families), but justified these arguments empirically using data from commercial organisations (such as private businesses). His comments regarding group membership are not difficult to understand given his focus on social groups, as it could be argued that "membership" is a common trait of social groups such as tribes. However, because subsequent researchers have applied Caplow's theory in commercial organisations, this may explain why researchers have tended to measure size according to the number of employees in the firm. That is, while the original theory concerning size focused on social organisations, the contemporary literature may have transferred this to commercial organisations with little modification to the underlying measurement theory. This may also explain why some authors hypothesize a relationship between size as measured by *Number of Employees* and increasing organisational complexity.

Third, Caplow's work examines not only an organisation's human capacity but also its complexity and degree of internal inter-relationship. Indirectly, Caplow's work seems to suggest that an organisation's size describes not only the members of an organisation but also the activities that these members undertake. This suggests that size may have several dimensions and may not be easily measured by quantifying human capital alone. Researchers instead may need to take into account a behavioural aspect to the organisational size construct, which comprises an organisation's function in addition to its form.

Pugh et al. (1963, 1968, 1969) (The Aston Business School Studies)

The Aston Business School studies have received significant coverage in the research literature. While their contribution focused mainly on the effects and antecedents of organisational structure as opposed to size *per se*, their work involves substantial discussion of organisational size. As a result, it is worth giving their work some discussion in this study.

Pugh et al.'s (1963) first theoretical work attempted to relate organisational behaviour to organisational structure by reviewing the literature on bureaucracy. Their intention was to develop an instrument with which firms could be categorised according to structure. Their review of the literature resulted in the development of a conceptual framework comprising six dimensions of structure, being specialization, standardization, formalization, centralization, configuration and flexibility. Organisational size was given short coverage in this study, despite their comment that size is a "major determining factor of organisational structure" (p. 309). Interestingly, the authors directed future researchers to use *Number of Employees* and *Total Net Assets* as indicators for size, however they provide very little theoretical justification for this advice. The relationship between these indicators to the six structural dimensions discussed above is also unclear.

Pugh et al. (1968) later operationalised five of the dimensions of structure developed in their previous research. Insufficient data were available to operationalise the flexibility dimension which, the authors argue, would require more longitudinal analysis. The

authors collected data from 52 privately and publicly-held organisations using interview surveys. The authors randomized their sample according to organisational size as measured by *Number of Employees*.

The main implication arising from Pugh et al. (1968) is that, within their organisational analysis, the role of size was not easily understood. As Scott (1975) observes, their factor analysis showed that size loaded significantly onto the formalization, differentiation and standardization factors, but only exhibited a weak loading onto other factors. Finally, Pugh et al. (1968) used a multidimensional scaling technique to analyse the structure construct. This method allows them to separate individual dimensions within the construct.

Pugh et al. (1969) later used the same survey sample and data set to explore the hypothesized relationship between organisational context (comprising seven dimensions, including organisational size) and organisational structure. The study used two indicators of size, being *Number of Employees* and *Total Net Assets*, however the authors appeared uncertain as to which indicator was most appropriate. First, the authors observed substantial skewness in their sample with regard to the *Number of Employees*. This skewness violated the assumption of normality in multiple regression. Their solution to this problem was to take the natural log of *Number of Employees* as an indicator of size instead. On the grounds that "financial size might expose some interesting relationships with organisation structure that would not appear when only personnel size was used" (p. 98), the authors also planned to use *Net Assets* to capture financial size. However, the authors note that "the attempt to differentiate between these two aspects of size proved unsuccessful however [and] the logarithm of employees was therefore taken to represent both aspects of size" (p. 98). The results of the multivariate regression were inconclusive, with the authors positing both that size affects structure and that structure affects size. The authors argue that further research in the area of size is still required.

Pugh et al. (1969) observed the inconsistency of size use in the extant research literature, reiterating Porter and Lawler's (1965) claim to this effect. An important implication for this study is that the authors do seem to argue that size appears to be a "summary" of other concepts: "the factor may obscure particular relationships with the source variables which it summarises" (p. 98). Despite this, the authors still treated organisational size as a first-order construct, without further exploring this multi-dimensionality.

Smyth et al. (1975) and Shalit and Sankar (1977)

The economic statistics literature has also given some very brief coverage to solving the problem of size inconsistency. Two studies which discussed size measurement are Smyth et al. (1975) and Shalit and Sankar (1977). These studies are examined together in this section because the latter paper makes critical discussion of the former. Importantly, however, they only give advice as to size measurement, without discussing the actual size construct itself.

Smyth et al. (1975) observed that not only are several size indicators used in the economic statistics literature, but authors appear to believe that these size indicators are easily interchangeable with little adverse effect on the test's outcome. The study then set out to develop some conditions in which size indicator interchangeability is acceptable. Smyth et al. argued that, in order for two indicators to be interchangeable, the measures must be related in longitudinal terms. Conversely, "if the relationship between alternative measures of firm size is nonlinear…then different measures of firm size will yield

different conclusions" (p. 112). The study assumed that error variance for these size observations is constant; the degree to which this is an appropriate assumption is unknown.

Shalit and Sankar also explored commonly used organisational size measures, providing critical analysis of Smyth et al.'s study. In part, they aimed to address the lack of stochastic power in the Smyth et al. study. Shalit and Sankar first considered conditions where alternative measures of size are not only correlated but are also subject to the "unobservable true measure" of size. In such circumstances, the authors argue, model parameter mis-specification and significant error variance may cloud the test's result. Shalit and Sankar further developed the model of Smyth et al. by substituting sample terms with population terms, thus reducing the magnitude of possible error but requiring greater knowledge of coefficients and variance. In essence, in order to develop a better test for size indicator interchangeability, the authors imposed a requirement for more information regarding the sample of firms. From this theory and, using some empirical data, the authors developed an index table of different indicators based on different levels of error (lambda). The authors then showed that, in the absence of controlling conditions, size indicators are generally not easily interchangeable. The authors observed that *Total Assets* and *Owner's Equity* may be interchangeable for appropriate error variances.

These two studies provide several important implications for this study. First, the studies recognise part of the size problem and attempt to address it by exploring the construct's measurement. The arguments of Shalit and Sankar (1977) also suggest that it is important to contextualise the understanding of measurement with meaning. Further, without understanding the underlying construct, researchers cannot be sure that they are measuring what they think they're measuring. Second, as has been shown in this study, there is further evidence that size indicators are not easily interchangeable. This suggests that it is important to take into account the size indicator chosen. In this regard, further analysis of organisational size indicators is warranted.

Kimberly (1976)

Kimberly's work on organisational size is extremely useful for this study because the analysis presented therein raises implications for future study in the area. The research is useful for illustrating the existence of the problem and, more importantly, indirectly suggests valuable explanations as to why the problem has not yet been solved.

Kimberly conducted a review of papers that employed organisational size in the sociology literature. Kimberly sourced articles from five leading sociology journals, a select group of books and journals in other areas. Within this literature, Kimberly observed the rise in popularity of the size construct in empirical research but also perceives some disagreement regarding organisational size. From this body of work, Kimberly explored four broad areas, being the theory of size, the role of size in sociology research, the treatment of causality with respect to size and methodological issues of size use. These findings merit reiteration here.

With respect to the theory of size, Kimberly observed little ongoing theoretical development. Few researchers justify their use of organisational size. Theory development that is offered appears to be *post hoc*, where authors attempt not to build theory before conducting testing, but rather to justify occasionally spurious, inconsistent or unforeseen findings afterward. Reliable theoretical definitions of size also appear to be

lacking, yet Kimberley observed that researchers can still interpret size discussion from other studies. It is possible that researchers are relying on a 'tacit' understanding of what size means and researchers may find this understanding difficult or unnecessary to articulate.

With respect to the role of size in sociology, Kimberley observed that many authors refer to organisations and organisational types. Within this, however, Kimberly observed that the size construct can be used to explain many phenomena without appropriate justification. This is further complicated by the difficulty of agreeing on what should constitute an organisation in the first instance, and in clearly defining what constitutes an organisation type in the second instance.

With respect to the treatment of causality, Kimberly observed that most researchers merely refer to associative relationships, except where statistical methods have afforded authors the power (and burden) of developing more causal models. Interestingly, Kimberly also observed that most authors see firm size as an exogenous factor in their studies, generally responsible for causing the other phenomena present in their studies.

With respect to methodological observations, Kimberly made four important points. First, he asserted that many studies base their use of size on data availability rather than theoretical suitability, justifying indicator selection on what is perceived to be an approximately equivalent measurement approach in the extant literature. This "empirical pragmatism" (p. 582), Kimberly argued, may be borne partly out of researcher inexperience. Second, Kimberly observed some minor variability in terms of size measures. He noted that *Number of Employees* is by far the most common size indicator in use, though can find little justification for why this should be. He also observed four other indicators, being *Capacity*, *Number of Clients Served*, *Net Assets* and *Sales Volume*. Third, Kimberly discussed the increasing popularity of using natural log transforms on indicators and identifies problems of data distortion and assumptions of curvilinearity with respect to other regression variables. Kimberly's fourth point concerned the problem of developing mathematical models where one of the independent variables is also part of the dependent variable. As a case in point, Kimberly cited the "empirically tautological" problem (p. 584) of relating number of employees (as a size indicator) to the degree of human resource administrative overhead. Kimberly indirectly argued that findings from such testing should be treated with caution. Researchers, Kimberly argued, have not adequately assessed the effects of these problems.

Kimberly offers several directions for research which are of particular relevance to this study. First, Kimberly questioned the degree to which size indicators can be substituted for each other. This appears to contradict the earlier argument presented by Smyth et al. (1975) that indicators are interchangeable. Next, Kimberly observed that indicators of size in the literature appear to focus largely on the amount of resources held by the firm. There is a lack of convincing evidence that aspects such as structure, capacity and discretionary resources are adequately captured in these indicators. Further, the interaction between these aspects of size is not necessarily straightforward: the treatment of size may be inconsistent if individual indicators are not properly weighted in research models. Ultimately, Kimberly wrote, it may be necessary to stop using size altogether in organisational research because of the construct's inconsistency.

In the literature discussed by Kimberly, there does seem to be some evidence of cumulative tradition. Authors in the area regularly reference Blau and Caplow for direction and guidance. However, despite considerable recent literature coverage (such as

Harris and Katz 1991, Brown and Magill 1994 and Damanpour 1996), Kimberly's findings highlight the need for greater exploration of the conceptual meaning of organisational size. Kimberly's arguments appear to have either been ignored or found to be otherwise lacking.

Bujaki and Richardson (1997)

Bujaki and Richardson conducted a limited study of firm size as a research construct, focusing on its use in the accounting literature. Bujaki and Richardson's motivation originated from the seminal work of Ball and Foster (1982), who observed that size can be "interpreted in many different ways", hence limiting its applicability in research contexts. Bujaki and Richardson observed that, in the accounting literature, size is used as a proxy for many concepts, such as political costs, liquidity and expected returns. The authors then contended that firm size has not yet been validated with respect to these associated constructs and, as a result, is unreliable.

In order to explore these arguments, Bujaki and Richardson conducted a citation analysis of papers published in five core accounting research journals. They noted the construct proxied for by size, the indicator used to quantify size and the citations used to develop theory in each study.

The study found that size was used as a proxy for 18 separate constructs. The authors found five indicators used to quantify size, being *Market Value*, *Assets*, *Sales*, *Income* and *Number of Employees*. They argued that very little theoretical evidence could be found to relate size to each construct. The authors also argued that too few indicators are in use and that more indicators should be explored in order to improve validity.

The Bujaki and Richardson study has some implications for this study. First, their study covered just a single year of published research. It could be argued that a longer study might inform researcher understanding of the size construct by revealing more of its underlying dimensions and may give a greater insight into the wider research agenda. Second, their study only examined what organisational size proxies for, on the assumption that a lack of a relationship between organisational size and the construct implies poor construct validity. It could be argued that, before any conclusions can be drawn regarding the semantic correspondence between these dimensions, it is first necessary to understand what size itself actually means. Based on this analysis of meaning, researchers can develop appropriate indicators and some assessment can be made of the size construct's suitability for research purposes.

Importantly, Bujaki and Richardson also foreshadowed difficulties in operationally measuring size if the construct was eventually found to be multi-dimensional. The authors cited McDonald (1981), who argued that a construct must be unidimensional in order to possess construct validity. If size has more than one dimension of relevance, the authors argue, then it will be impossible to ascribe construct validity to it. This may mean that size should not be used in organisational research.

Implications

The evidence presented in the preceding sections gives some insight into the magnitude and extent of the organisational size problem in the wider literature. The research already undertaken gives direction for initial propositions regarding size. The studies discussed

above also offer some direction for this study's approach and method, and it is useful to learn from the methods employed in those papers. These are discussed below, first with respect to size and second with respect to method and approach.

Implications for Organisational Size

The first section presented instances of inconsistency with respect to constructs and indicators in the research literature. The evidence presented therein shows that after a forty year time period, researchers are still experiencing difficulty with the size construct. This difficulty exists at both the construct and indicator levels and may be testament to the extent and difficulty of the problem at hand. Evidence from the second section showed that several researchers have observed the problem in their own disciplines: presented in aggregate, however, the evidence suggests that the problem of size construct inconsistency occurs across disciplines. In the words of Dalton et al. (1980:51), "A lack of consistency in the reviewed studies may lead to an inadequate understanding of the role of organisation size".

Finally, it is worth briefly noting the frequency of use of organisational size in the literature. The arguments of several authors showed that size is receiving increasing use in the research literature (Goode 2001). Despite the inconsistency illustrated in this study, researchers still appear keen to see if the phenomena under examination can explain, or are related to, organisational size. One explanation for this rise is that there has been a nominal rise in the number of published studies and a corresponding increase in the number of studies using the size construct. However, another possible explanation is that researchers are unsure as to what size means and are ascribing more terms to the construct. Instead of seeking new individual indicators to describe these terms, researchers gather them under the "umbrella" of organisational size. This results in more studies involving size, increased mismeasurement and, ultimately, dilution of the explanatory power of the size construct.

The overwhelming theoretical argument that size must somehow be important (e.g. Rouleau and Clegg 1992) may compel authors to search for potential explanations for the unexpected findings in their work. The ability for researchers to fit the data to match their expectations or research goals is documented in other areas. For example, with respect to factor analysis, Steiger (1990:175) wrote, "What percentage of researchers would find themselves unable to think up a 'theoretical justification' for freeing a parameter? In the absence of empirical information to the contrary, I assume that the answer… is 'near zero'".

Implications for Method and Approach

Despite the lack of research in the area, some tentative observations regarding appropriate research methods can be made. First, the literature review and citation search approaches have received patronage. Whereas many of the authors cited in Section 0 above have mostly used the literature review to identify the problem, rather than develop solutions to construct disagreement, the method is nonetheless useful for identifying dimensions to the size construct.

With regard to data collection, most of the studies employed the questionnaire survey method. In at least one case, the survey provided a data set that was used across two published studies (Pugh et al. 1968 and Pugh et al. 1969). The survey method allows a large number of research variables to be gathered in a relatively quick and cost effective

manner. It is important to note, however, that this problem is more than just a conventional matter of instrument development. The literature reviewed above reveals a combination of poor theory development and inconsistent results. This condition has arisen largely because researchers have given so little thought to the problems of measurement, meaning and possible multi-dimensionality.

With regard to statistical methods, the multivariate regression, correlation analysis and multi-dimensional scaling methods have each seen use. Pugh et al. (1968) used the multi-dimensional scaling method as it allowed them to separate and identify possible dimensions within the size construct.

Summary and Conclusions

The evidence presented in this study has illustrated the organisational size problem from two perspectives. First, the evidence showed that, throughout the range of research literature, studies can be found which have clearly delivered conflicting results with reference to organisational size. Some studies find the construct to be statistically or theoretically important while others find it lacks persuasive power. These studies do not appear to be restricted to a particular field or period of observation.

Evidence presented in this study has shown that some other authors have also recognised the problem of size inconsistency. These authors have observed that the findings of previous studies involving size have been inconsistent and occasionally conflicting. To a lesser extent, this observation of inconsistency extends to the information systems literature (notably with regard to technology adoption).

This evidence suggests that the problem requires deeper analysis, however this study also saw that there has been very little published work that attempts to solve the size problem. The study also showed that there has been little recognition of the problem of size inconsistency, despite the construct's importance in areas such as adoption analysis. Possible explanations for the inconsistency include a lack of agreement over the construct, or a lack of agreement regarding the type or number of indicators to use. Disagreement exists even over these explanations. Clearly, the problem requires further investigation.

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