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Comparing how entrepreneurs and managers represent the elements of the business model canvas

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Abstract:

This paper uses self-efficacy to compare how entrepreneurs and managers represent the nine elements of the business model canvas (BMC; Osterwalder, 2004). A six-item efficacy scale was developed to measure each element. Principal components analysis was conducted on the total scale scores of 108 Irish entrepreneurs and 63 Irish managers separately; two components emerged for entrepreneurs, and a different two components surfaced for managers. The self-efficacy data suggest that mental representations of the BMC may be two-dimensional and that they may differ between entrepreneurs and managers. This study extends the reach of the BMC to the individual level and also extends previous research on self-efficacy differences between entrepreneurs and managers.

Keywords:

Business model canvas; Mental representations; Self-efficacy; Scale development; Principal components analysis (PCA).

1. Introduction

Osterwalder's (2004) business model canvas (BMC) is popular among entrepreneurs because it helps them to make sense of "doing business" (Blank, 2013; Massa and Tucci, 2013; Trimi and Berbegal-Mirabent, 2012). The BMC contains nine structured elements of knowledge that represent the content ("what") of doing business. Cognitive science tells us that such sense-making tools (cognitive maps) can help reveal differences in the mental representations of entrepreneurs and managers (e.g., Gregoire et al., 2011). But the BMC has hitherto not been used in this way. It is important to address this gap because an understanding of cognitive differences is key to understanding what, when, how, and why entrepreneurs do (Brannback and Carsrud, 2017). To begin the process of addressing this gap, this paper uses the self-efficacy construct because Bandura (e.g., 2006) outlines how it can help reveal the patterning of people's mental representations of domain knowledge, such as that contained in the BMC.

First, consistent with the idea that self-efficacy builds on a dual system of knowledge and cognitive skills (e.g., Bandura, 1997), each of the nine BMC elements was represented as a function of six cognitive processes, and this two-dimensional tabular framework (see Figure 2) as well as relevant literature were used to generate a set of activities for each element. Next, to measure perceived capabilities concerning these activity sets, nine self-efficacy scales were developed. Then when conducting principal components analysis (PCA) on the total scale scores of 108 Irish entrepreneurs and 63 Irish managers separately, it transpired that these nine variables could be represented by a much smaller number of dimensions without much loss of information. But the content of these mental representations differed between entrepreneurs and managers. These results are compared with those of the existing literature in terms of both the number and the interpretation of the components obtained.

By using self-efficacy to investigate how entrepreneurs and managers represent the nine business model elements, this study provides an empirical foundation for extending the reach of the BMC to the individual level, and it also extends the empirical evidence on self-efficacy differences between entrepreneurs and managers

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature and positions our study among comparable work. Section 3 describes the method. Section 4 presents and interprets the results of the statistical analysis. And finally, Section 5 discusses implications, limitations and ideas for future research.

2. Business model canvas and self-efficacy

The business model canvas (BMC) is a firm-level concept of business model (see, e.g., Osterwalder, 2004; Osterwalder et al., 2005; Osterwalder and Pigneur, 2009). It involves nine related elements of knowledge, which represent the content ("what") of "doing business". Table 1 below describes these elements. Before turning to how they are conceptually related, we acknowledge that such elements are difficult to operationalise and measure because they do not consider the process ("how") of doing business (Zott et al., 2011). But for the purposes of operationalisation and measurement, one could take an activity-system perspective on the BMC, since activity sets support each of its elements (for related comments, see Morris et al., 2005). Such a perspective will require the addition of a cognitive process dimension to the BMC, because statements of activities generally contain knowledge regarding what to do and how to do it.

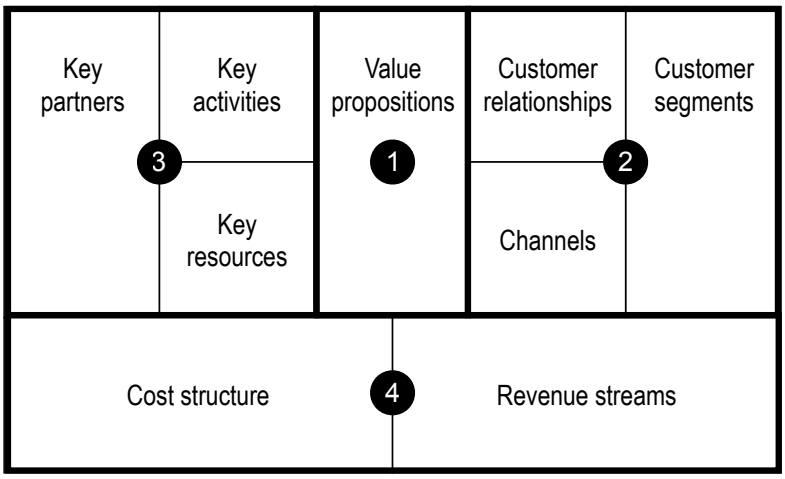
Table 1. The BMC elements and their descriptions (adapted from Osterwalder and colleagues)

Elements	Descriptions
Customer segments	A firm serves its value proposition(s) to one or more customer segments
Value propositions	A firm offers a mix of products/services to create value for each customer segment
Channels	A firm communicates and delivers its value proposition to each customer segment via various channels
Customer relationships	A firm establishes and maintains relationships with each customer segment
Revenue streams	A firm generates revenue streams from the delivery of value to each customer segment
Key resources	A firm requires resources (e.g., people) to create and deliver the business model elements
Key activities	A firm performs a set of activities to create and deliver the business model elements
Key partners	A firm may outsource some activities to its network of suppliers/partners
Cost structure	Each element of a firm's business model has a cost component

Regarding the relationships among the nine elements, Osterwalder (2004) was influenced by Kaplan and Norton (1992) in that the BMC was proposed as a four-dimensional concept of business model. In other words the nine elements can be represented by four factors. Incidentally, not all business model concepts are four-dimensional. For instance, Magretta posits that all business models have two parts: "*Part one includes all the activities associated with making something: designing it, purchasing raw materials, manufacturing, and so on. Part two includes all the activities associated with selling something: finding and reaching customers, transacting a sale, distributing the product or delivering the service*" (2002: 88). Indeed, there continues to be debate in the literature about the dimensionality of the business model concept (see, e.g., Morris et al., 2005).

Notwithstanding the above debate, the factors of the BMC are shown in Figure 1 below where they are labelled 1 to 4 and enclosed by heavy lines. Osterwalder (2004), however, stated that these are not the core of the BMC, but are a “rough” categorisation of the nine elements. This then raises the question regarding the number of dimensions represented by the elements and the relative importance of each element to the dimensions. Simply put, a more precise representation is required; after all, dimensionality is a basic issue in empirical research. Solutions to this problem can be obtained using dimensionality reduction techniques, such as principal components analysis, which can help represent the nine elements by a smaller number of underlying dimensions and estimate how well each element represents the dimensions.

Figure 1. Conceptual representation of the BMC (adapted from Osterwalder, 2004)



Note: 1 = Product; 2 = Customer interface; 3 = Infrastructure management; and 4 = Financial aspects.

The dimensionality of the BMC is a key issue for both entrepreneurship and management research on the business model (Amit and Zott, 2001; Magretta, 2002; Morris et al., 2005; Tikkanen et al., 2005). This is because while there is no one best business model for everyone, some type of business model is surfacing as a mechanism used by entrepreneurs and by managers (George and Bock, 2011; Zott and Amit, 2010). So when

attempting to model the role of the BMC in either entrepreneurial or managerial processes, a researcher would generally like to replace the nine elements by a smaller number of independent variables. Indeed, researchers would typically prefer to work in lower dimensions for ease of interpretability, visualisation, understanding of the main underlying features, removing extraneous information, and so on.

The structure underlying the BMC is an important issue for those interested in the study of cognition, as it relates to how people represent nine content aspects of doing business – how they "connect the dots" so to speak (Baron, 2006; Gregoire et al., 2011; Krueger, 2007; Walsh, 1995). In entrepreneurial cognition research, it is usually assumed that such mental representations not only underlie thought (e.g., self-efficacy) and action (e.g., firm creation), but they also distinguish entrepreneurs from managers. For example, Brannback and Carsrud (2009, 2017) posit that sense-making tools such as the BMC are a valid way of examining entrepreneurs' mental models and also of understanding differences in mental representations between entrepreneurs and managers. However, they concluded that this area of research has yet to be fully explored.

While it creates a cognitive map of nine elements of firm activities, the BMC has hitherto not been used to either study how entrepreneurs think or to compare how they differ from managers in their thinking. In fact, a search of the entrepreneurship literature revealed only seven studies, none of which have attempted to represent the nine BMC elements by a smaller set. Table 2 below summarises these studies (apparently managers' mental representations of the BMC have not been studied either). It highlights a lack of empirical work. If the BMC could reveal differences in the mental models of entrepreneurs and managers, then it should be used in this way because, "*understanding cognitive*

differences is central for understanding what, how, why, and when entrepreneurs do" (Brannback and Carsrud, 2017: 123).

Table 2. Entrepreneurship studies on the BMC

Author(s), Year	Description
Gabriel and Kirkwood, 2016	The BMC was used as a template to analyse interview data obtained from 43 renewable energy entrepreneurs in 28 developing countries. Three different types of firms were identified.
Jackson, Scott, and Schwagler, 2015	The BMC was used to outline a methods approach for teaching the financial areas of entrepreneurship to future students. The learning outcomes of utilising a financial model together with the BMC are provided.
Leschke, 2013	A 16-element version of the BMC was developed to study the benefits of business modelling in an introductory entrepreneurship course. Apparently the course may offer a bridge between business modelling and planning for entrepreneurs as well as students.
Neumeyer and Mckenna, 2016	The BMC was used with 46 students from five disciplines (e.g., engineering) on a graduate-level entrepreneurship course with a focus on energy and sustainability. Survey responses on 10 items showed a statistically signifiant effect of time on students' peer review scores ($p < .01$).
O'Neill, 2015	The BMC was used as a platform to map out the library resources available to entrepreneurship students in assessing their opportunities.
Turko, 2016	The perceptions of 79 business and economics students – who had taken two semesters of entrepreneurship classes – about using business planning versus the BMC were compared using survey responses on 10 items. Business planning was perceived to be a superior approach.
Walske and Tyson, 2015	The BMC was mentioned in the abstract and, while not used to study the 8 founders/founding teams who had scaled, key resources (finance) and partners emerged as success factors.

The seven studies also appear to lack the theoretical foundations needed to investigate the dimensionality of the BMC in entrepreneurs. To provide such foundations some scholars of the entrepreneur's business model (e.g., Morris et al., 2005) and of entrepreneurial cognition (e.g., Gregoire et al., 2011) might suggest the construct of perceived self-efficacy – "*beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments*" (Bandura, 1997: 3). Perhaps this

suggestion is not so surprising, considering that efficacy beliefs are activity-specific and that activity sets support each of the BMC elements. Self-efficacy is a mechanism by which such elements and related skills are turned into action, and given our desire to study the structure underlying the BMC, it seems easiest to quote Bandura:

> "*Guided by a sound conceptual scheme in the construction of efficacy items, factor analysis can help to verify the multifaceted structure of efficacy beliefs*" (1997: 45).

Bandura's (e.g., 1977) theory asserts that self-efficacy and mental representations coevolve; both mechanisms are developed by four experiential sources, and the more reliable the source, the greater the development.[1] Following Krueger and Day (2010), this implies that major change in mental models of the BMC elements should be accompanied by major shifts in related efficacy beliefs. However, in previous research, Chen et al. (1998) tailored 26 efficacy items to five aspects of entrepreneurship and when doing factor analysis on the individual item scores for a combined sample of 103 entrepreneurs, 72 managers, 112 MBAs and 29 undergrads, they confirmed the proposed five-factor structure. But while this suggested that people's mental models of the individual activities look the same, the entrepreneurs had significantly higher total efficacy scores than managers.

So considering the above disjunction between self-efficacy theory and research, it is not clear whether entrepreneurs and managers will represent the BMC elements in a similar or different way. But our review suggests that self-efficacy along with factor analysis can be used to find out. Parenthetically, principal components analysis is another dimensionality

[1] The sources are: "*performance accomplishments, vicarious experience, verbal persuasion, and physiological states*" (Bandura, 1977: 191).

reduction technique that can be used prior to, in conjunction with, or as an alternative to factor analysis. The method is described in the next section.

3. Method

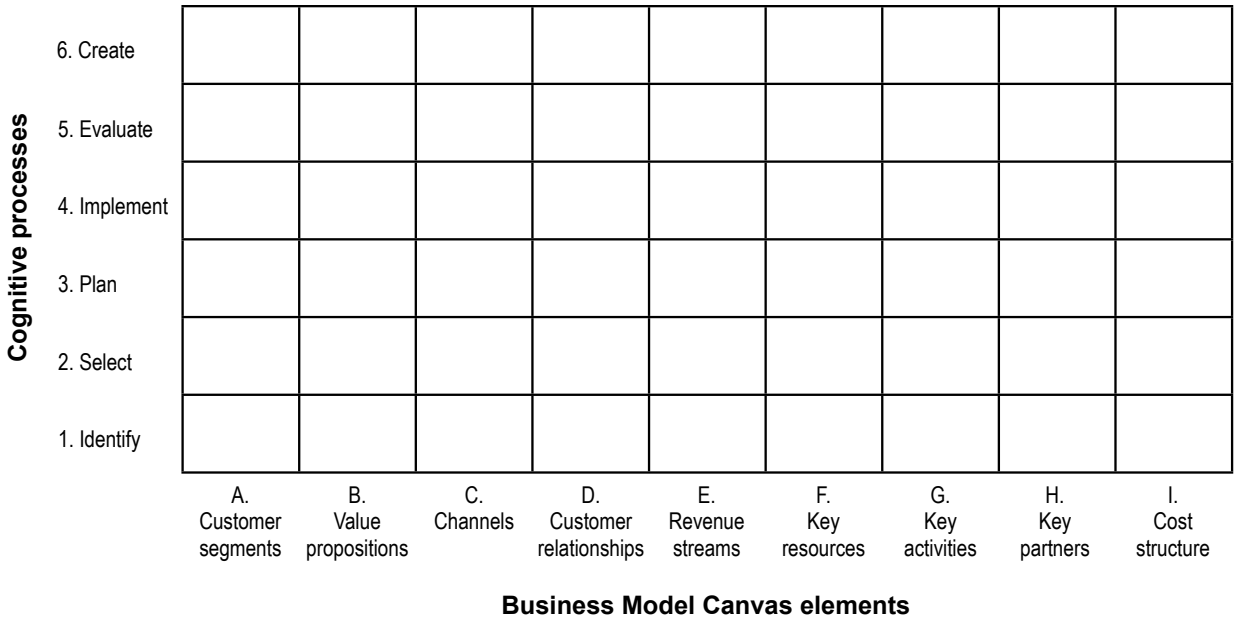
Good practice in construct measurement (e.g., Hulland, 1999) suggests that each of the nine BMC elements should be measured by multiple items. The guidelines for developing efficacy scales state, "*Including only a few items will limit the alpha level. Increase the number of items*" (Bandura, 2006: 316). Following Boone and Boone (2012), a quantitative measure of each element could be created by computing an overall score from at least four Likert-type items. These measures are required to use dimensionality reduction techniques, which can help represent such variables by a smaller set and can facilitate assessment of similarity or dissimilarity between samples of multivariate data. The approach used to operationalise the BMC is described below.

3.1. Two-dimensional tabular framework

Bandura's (2006) guidelines suggest that each of the nine BMC elements should be operationalised by a set of activities representing a range of difficulty. An interpretation of Krathwohl's (2002) approach to describing objectives/activities implies that each element could be represented as a function of a number of cognitive processes, which could be ordered on a scale from simple (e.g., *identify*) to complex (e.g., *create*). Krathwohl notes that in some sense, such a scale is a hierarchy of judged complexity. Notwithstanding this empirical question, the idea of adding a cognitive process dimension to the BMC is consistent with Bandura's (e.g., 1997) assertion that self-efficacy is a mechanism by which knowledge and skills are turned into action, and is consistent with Zott et al. (2011) in that business model research requires concurrent consideration of the content (know-what) and process (know-how) of doing business.

Figure 2 below shows how each of the nine BMC elements was represented as a function of six cognitive processes. In this two-dimensional tabular framework these processes are ordered on a scale that roughly ranges from simple to complex. The proposed order seems similar to that proposed by McGee et al. (2009) who tailored 75 efficacy items to four sequential processes (i.e., search, plan, marshal and implement). Like Chen et al. (1998), they confirmed a multidimensional structure of entrepreneurial self-efficacy. While our approach to operationalising the BMC is systematic, it is not a precise science and does not encompass all relevant activities. Nevertheless, Figure 2 provides a clear visual representation that allows classifying a set of activities for each of the nine elements.

Figure 2. Two-dimensional tabular framework



For instance, the underlying variable in cell A1 of Figure 2 can be interpreted as '*identify potential customers*' (for a similar activity, see Gatewood et al., 1995). Likewise, related to Drucker's (2008) idea about the purpose of a business, the variable in cell A6 can be

interpreted as '*create enough customers for a viable business'* (see also, e.g., Sullivan and Adcock, 2002). And regarding the subtle problem of difficulty level, it is one thing to identify a potential customer. It is quite another to create an actual customer. Given data on the six variables in column A, a total score can be created to provide an overall measure of Customer segments. Also, the two-dimensional table allows for an overall measure of Value propositions, an overall measure of Channels, and so on. And finally, it establishes the boundaries for a BMC-based self-efficacy construct.

3.2. Scale construction

A self-efficacy scale was constructed to measure the 54 activities defined by Figure 2. Following Bandura's guidelines, each item was phrased as a judgement of capability. Thus the efficacy variable A1 was phrased as follows: 'I *can* identify potential customers'. All items were scored on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Following Hinkin (1995), reverse-scored items were avoided. Two expert panels – one consisting of two academics, the other of five entrepreneurs – were enlisted to pretest and pilot test the items. The final 'Customer segments' subscale is presented in Table 3 below.

Table 3. The Customer segments subscale

Item	Efficacy statement
A1	I can identify potential customers
A2	I can select potential customers worth pursuing
A3	I can plan how to win new customers
A4	I can win new customers as planned
A5	I can evaluate the performance of new customers
A6	I can create enough customers for a viable business

Note: Item codes correspond to the underlying variables in Figure 2.

The efficacy scale comprised nine subscales, each containing six items. The first efficacy item from each of these subscales is shown in Table 4 below.

Table 4. The first item from each of the subscales

Item	Efficacy statement
A1	I can identify potential customers
B1	I can identify what customers value
C1	I can identify channels to communicate with, and deliver solutions to, customers
D1	I can identify various ways to establish relationships with customers
E1	I can identify potential revenue streams from the sale of products/services
F1	I can identify potential resources to create, deliver, and capture value
G1	I can identify possible ways to create, deliver, and capture value
H1	I can identify potential partners with whom to do business
I1	I can identify the costs associated with doing business

Note: Item codes correspond to the underlying variables in Figure 2.

3.3. Data collection

A questionnaire containing the scale and questions on demographics (e.g., age, education, gender) was developed to gather data from practicing entrepreneurs and managers. Similar to the approach of Chen et al. (1998), individuals who had started their current firms were considered entrepreneurs. Likewise, those who had not started their current businesses, but who were managing in those firms, were considered managers. The usual precautions were taken to minimise response bias, e.g. respondents' names were not recorded (Bandura, 2006). As a safeguard against inconsistent scoring, the nine items in Table 4 were repeated and placed towards the end of the questionnaire.

A survey was conducted in Ireland to collect data from a quota sample of entrepreneurs and managers that would be comparable in size to that of Chen et al. (1998). Incomplete questionnaires were removed. Subjects' scores on the repeated items were compared with their responses to the corresponding variables; three outliers (gross errors) were removed from each sample. The nine subscale scores were created by calculating a total score from the six respective 7-point items. Each of these interval variables has a value from 6 to 42, and one can thus treat them as quantitative for data analysis purposes.

3.4. Sample description

Based on the above criteria, 108 entrepreneurs and 63 managers successfully completed the survey. Table 5 below presents descriptive statistics for the main demographic variables. Just under half of entrepreneurs fell in the 18-44 age category, whereas a large majority of managers fell in this age group; the sample was generally similar in terms of education level, with a large majority of both groups having completed a university degree; and females were underrepresented in entrepreneurs but overrepresented in managers.

Table 5. Descriptive statistics for the demographic variables

		Entrepreneurs		Managers	
Factor		n	%	n	%
Age	18-44	52	48.1	53	84.1
	45 and above	56	51.9	10	15.9
Education	Non-university	26	24.1	21	33.3
	University	82	75.9	42	66.7
Gender	Female	32	29.6	48	76.2
	Male	76	70.4	15	23.8

N = 171

The entrepreneurs' firms averaged 8.6 years in business (ranging from 1 to 40 years), represented a majority of sectors in the European industrial activity classification scheme (NACE Rev. 2; 2008), and 79.6% had less than 10 employees. We did not gather comparable data for managers.

4. Results

4.1. Descriptive statistics and reliabilities

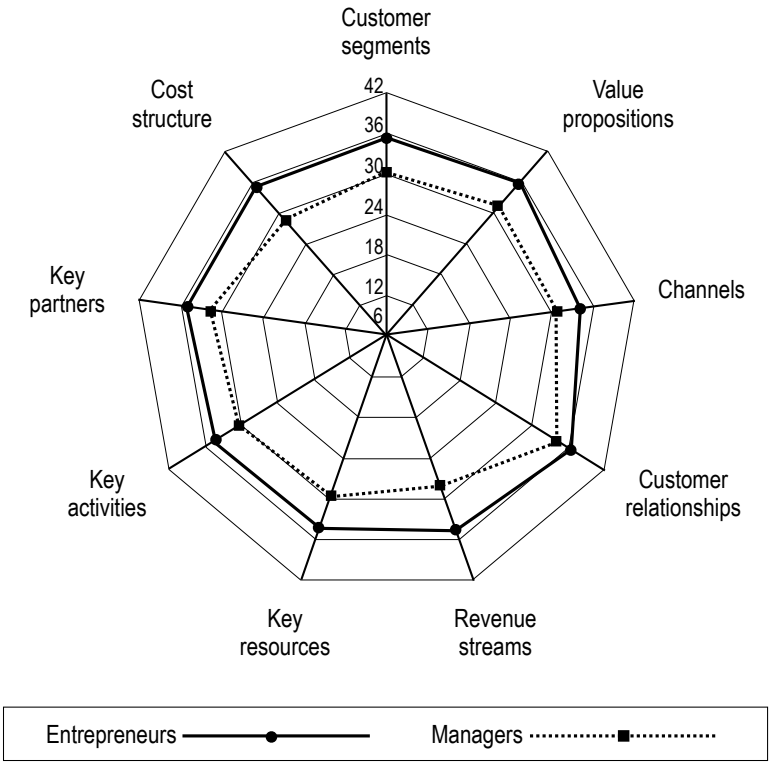
Table 6 below provides descriptive statistics for the nine quantitative variables. For each one of these variables, the mean total self-efficacy score of entrepreneurs was significantly higher than that of managers (*p*-value close to 0 in all cases). Figure 3 plots these scores.

Table 6. Descriptive statistics for the efficacy variables

	Entrepreneurs		Managers	
Variable	Mean	Std. dev.	Mean	Std. dev.
1. Customer segments	35.27	3.81	30.62	4.45
2. Value propositions	35.90	3.56	31.75	4.17
3. Channels	34.04	4.50	31.32	5.22
4. Customer relationships	36.89	3.15	34.75	4.23
5. Revenue streams	34.05	4.71	28.54	5.86
6. Key resources	33.55	4.92	29.98	5.05
7. Key activities	34.18	4.27	30.41	5.58
8. Key partners	35.31	4.98	32.22	5.47
9. Cost structure	35.05	5.15	28.79	7.36

N = 171

Figure 3. Scores of entrepreneurs and managers



Internal consistency reliabilities were computed using Cronbach's coefficient alpha. The value of alpha was 0.88 for entrepreneurs, and was 0.87 for managers. Thus, for each of the two samples, the nine variables were internally consistent.

4.2. Dimensionality reduction

Principal components analysis (PCA) is a dimensionality reduction technique. It attempts to replace the original variables by a smaller set of principal components (PCs), each of which is a linear combination of the original variables. These PCs are constructed to have decreasing variance, to be mutually orthogonal and to be such that the sum of their variances is equal to the sum of the variances of the original variables. The sample PCs extracted are estimates of the corresponding population PCs.

Like factor analysis, PCA requires a large sample size and/or subject to item ratio, but for researchers using either technique, there are no absolute guidelines regarding the size

either of *N* or of the ratio (Osborne and Costello, 2004). As regards an absolute minimum sample size, some studies suggest an *N* of 50 (e.g., Barrett and Kline, 1981) and we recall that there were 108 entrepreneurs and 63 managers. In respect of the subject to item ratio, some approaches assert a minimum of 5 to 1 (e.g., Hatcher, 1994) and while we were slightly biased by the fact that there were only nine interval (quantitative) variables, we note that the ratio was 12 to 1 for entrepreneurs, and was 7 to 1 for managers.

Additionally, a common statistical test for sample size adequacy is one based on the magnitude of the Kaiser-Meyer-Olkin (KMO) statistic; if its value is above 0.5, the sample size may be viewed as adequate for PCA. A second consideration is whether PCA is suitable at all. If Bartlett's test of sphericity has a *p*-value below 0.05, then some dimensionality reduction can be expected by using PCA. For entrepreneurs' scores on the nine efficacy variables, as the KMO value was 0.87 and Bartlett's test was highly significant (p-value < 0.001), PCA should be considered appropriate. Likewise, we were confident that PCA was suitable for the managers' scores on these variables (KMO value = 0.81 and p-value < 0.001 for Bartlett's test).

PCA with Varimax rotation, which endeavours to give an easier interpretation of the PCs by minimising the number of variables with large loadings on each of the factors, was conducted on the entrepreneur and manager data separately. In each case examination of Cattell's scree plot indicated a two-component solution. The results of PCA are presented in Table 7, which gives the first two PCs extracted in each of two cases, along with their eigenvector and percent of variance explained.

Table 7. Results of PCA

	Entrepreneurs		Managers	
Variable	PC1	PC2	PC1	PC2
1. Customer segments	0.39	0.69	0.38	0.43
2. Value propositions	0.18	0.74	0.69	-0.02
3. Channels	0.09	0.86	0.81	0.22
4. Customer relationships	0.35	0.62	0.60	0.31
5. Revenue streams	0.75	0.33	0.36	0.74
6. Key resources	0.80	0.32	0.83	0.37
7. Key activities	0.55	0.56	0.78	0.23
8. Key partners	0.57	0.42	0.69	0.37
9. Cost structure	0.85	0.04	0.02	0.97
% of variance	52.2	12.5	50.7	17.6

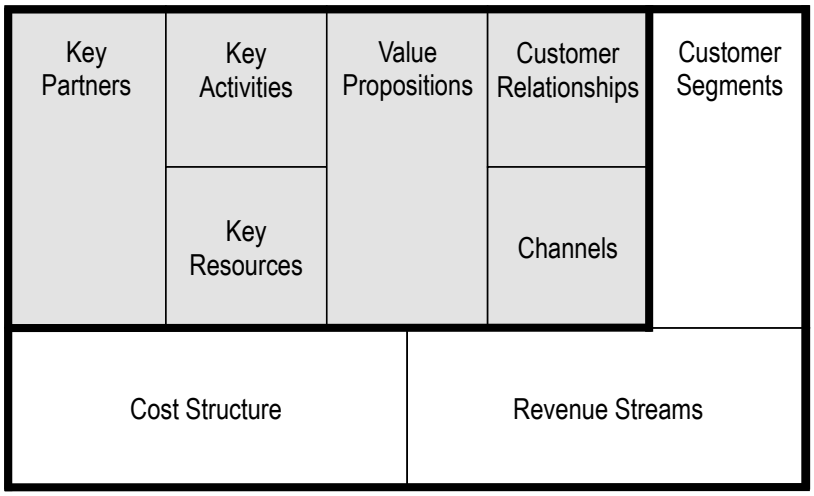
Rotation Method: Varimax with Kaiser Normalization.

For entrepreneurs, the PCs explained 64.7% of variation in the data on the original nine variables: 52.2% and 12.5%, respectively. PC1 gave relatively high weights to the variables Cost structure, Key resources, Revenue streams, Key partners and Key activities, which are all measures related to a company's finances and operations. By contrast, PC2 had some high weights associated with Channels, Value propositions, Customer segments, Customer relationships and Key activities, which are related to serving products to new and existing customers. Thus it is pleasing that the two PCs were not only orthogonal variables (by construction) but appeared to assess different aspects of venturing (essentially '*Finance and Operations*' and '*Serving Products to New and Existing Customers*'). However, it is noteworthy that each PC had fairly high loading associated with Key activities; this may merit more attention by investigators with larger samples.[2]

[2] A PCA with Quartimax rotation, which endeavours to give an easier interpretation of the original variables, was conducted on the entrepreneurs; the weight associated with *Key activities* was fairly high for PC1, and was fairly low for PC2. A PCA with Equamax rotation was also performed on these data and when compared with the Varimax solution, the loadings associated with *Key activities* did not change.

For managers, the PCs accounted for 68.3% of the variance in the data. PC1 gave relatively high loadings to the variables Key resources, Channels, Key activities, Key partners, Value propositions and Customer relationships, which are all measures associated with making products and serving them to existing customers. On the other hand, PC2 had some high weights associated with Cost structure and Revenue streams, which are associated with a firm's finances. Therefore the two PCs were not only independent variables but seemed to measure various aspects of venturing: '*Making Products and Serving them to Existing Customers*' and '*Costs and Revenues*'. As it had relatively lower loadings on these PCs, the variable Customer segments is notably absent from this initial interpretation. However, by lowering the threshold for significant loading, Figure 4 shows an interpretation in which Customer segments is important in PC2.[3]

Figure 4. Structure of the manager data



In this figure, the two PCs are enclosed by heavy lines, the first PC is shaded, and to make interpretation easier, variables with loadings less than .40 are not drawn.

[3] Following Kline (1994), with larger samples, researchers would regard factor loadings as moderately high if they are greater than 0.3.

In summary, when conducting PCA on the entrepreneur and manager data separately, it transpired that the original nine variables were quite well represented by just two principal components, but the entrepreneurs represented these nine variables differently than managers. Simply put, two underlying dimensions surfaced for the entrepreneurs, and a different two principal components emerged for managers. Hence and for other reasons, it was decided not to conduct common principal components on both samples (for a review of this technique, see e.g. Hardle and Simar, 2007).

5. Discussion

The self-efficacy data described in this study suggest that entrepreneurs and managers may represent the nine elements of the business model canvas (BMC) by two dimensions, but that the content of these mental representations may differ between the two groups. Implications, limitations and suggestions for further research are discussed.

5.1. Implications

The findings are important not least because they, for the first time, shed some light on the dimensionality of the BMC in entrepreneurs and managers. The results imply that the BMC may be two-dimensional, and in this regard may have some utility in understanding how entrepreneurs differ from managers. Based on theoretical work, Osterwalder (2004) represented the BMC by four factors (Figure 1). But our empirical models differ slightly in that they can be interpreted for entrepreneurs as (1) *Finance and Operations* and (2) *Serving Products to New and Existing Customers*, and for managers as (1) *Making Products and Serving them to Existing Customers* and (2) *Costs and Revenues*. Each of our representations has more in common with Magretta's (2002) assertion that a business model has two parts. But neither of our models can be interpreted relative to Magretta's

claim that these parts include all the activities involved in making something and all the activities involved in selling something.

The two-dimensional tabular framework used to operationalise the nine-element BMC (Figure 2) is important for several reasons. First, it allows classifying a set of six activities for each of the elements. Second, while we focused on representations of the BMC, the framework also encourages investigation of representations of the cognitive processes. A third notable feature of the framework is that it promotes the reliability of the scales used to measure the BMC elements, because each of the corresponding activity sets contains six related items; e.g., one cannot create enough customer for a viable business without identifying them first. However, one could also argue that for each of the nine elements, the framework raises the possibility of redundancy. Yet for those who develop scales, redundancy is not a liability but an asset, both for validity as well as for reliability (DeVellis, 2016). The framework and the accompanying efficacy measures have some face validity and have shown some discriminatory value.

The evidence that entrepreneurs may represent the nine BMC elements differently than managers is a key contribution to social cognition, because our data are consistent with Bandura's (1977) theory that experiential sources influence how mental models and self-efficacy develop. This reinforces the importance of our results. But apparently our interval data stand in contrast to Chen et al.'s (1998) ordinal data, which implied that entrepreneurs and managers represent 26 efficacy items in a similar way. Additionally, unlike Chen et al.'s multidimensional construct, our data suggested a two-dimensional efficacy construct. Still, it is notable that both entrepreneurial and managerial efficacy are assumed to be multidimensional in nature (Bandura, 2011). But considering that the dimensionality of our construct is intertwined with that of the BMC, it is not difficult to see

why ours is two-dimensional in nature. Indeed, unlike Chen et al.'s construct, ours does not include some key aspects of venturing, e.g. risk and strategy.

5.2. Limitations

This study has a number of limitations. First, we reiterate that the approach used here to operationalise and measure the BMC is not a precise science and it does not encompass all related activities. For instance, interested researchers may wish to add other cognitive processes (e.g., problem solving) to the six that we used (for a comprehensive list, see Krathwohl, 2002). And as already noted, the issue of practitioners' mental representations of our six cognitive processes may prove to be insightful. Considering, for example, that previous self-efficacy research on such processes suggests a multidimensional structure (McGee et al., 2009). A second related issue is that there is no single index of a capability belief against which to assess the validity of a given measure employed to evaluate it (Bandura, 1997). So validity evidence for our nine efficacy measures will be required. This is important because other variables could have accounted for the observed differences in representations between entrepreneurs and managers; we recall that our entrepreneurs were older and male-dominated, and that our managers were younger and female-dominated.

Crucially, while we accessed practitioners as opposed to students, our findings are not highly generalisable in that they pertain to a convenience sample of 108 Irish entrepreneurs and 63 Irish managers. That said, Chow (2002) actually argues that such samples should not impact the objectivity of the results of cognitive studies when their validity is evaluated with regard to clear theoretically grounded criteria. In this regard, we note that we were informed by Bandura's (e.g., 1977) theory of learning. Additionally, following Fricker (2008), responses from our convenience sample may be useful in

generating research hypotheses regarding, for example, the relative importance of each BMC element to the entrepreneur and manager models. Regarding this, see the Appendix. Nevertheless, for the various reasons outlined above – primarily the non-probabilistic data collection process – our findings should be viewed as exploratory in nature. Notwithstanding the need for larger and more representative samples, interested researchers could also gather data on the entrepreneurial type (e.g., expert, nascent) and the managerial type (e.g., finance, marketing, operations) being studied. Such data may reveal different representations of the BMC.

5.3. Conclusion

The results of this exploratory study suggest that entrepreneurs and managers may represent the nine BMC elements by two factors, but that the two groups may represent the elements in a different way. By using a self-efficacy lens, this study not only extends the reach of the BMC to the individual level, but it also sheds new light on the structure underlying self-efficacy in entrepreneurs and managers. Still, more research is needed on representations of the BMC and of self-efficacy, and in this regard it is hoped that our approach will stimulate conversation among scholars and practitioners.

Appendix A

Hypotheses for verifying the structure of the BMC

Kline (1994) notes that the main limitation of using dimensionality reduction techniques is that there is almost an infinite number of mathematically equivalent solutions and thus that the results of these techniques are hard to replicate. He concludes that for the purpose of confirmatory analysis in the social sciences, it is difficult to be precise about what the coefficients should be. But by the same token, Kline also states, "*if the target matrix is specified in a more general fashion, e.g. each variable being specified as a high, low or zero loading, then it is difficult to reject the hypothesized target matrix*" (1994: 11). Accordingly, by using Kline's general criteria in conjunction with our results (Table 7), Table A.1 below gives a hypothesised target matrix. Confirmatory analysis can be used to test these hypotheses.

Table A.1: Target matrix

	Entrepreneurs		Managers	
Variable	PC1	PC2	PC1	PC2
1. Customer segments	L	H	L	L
2. Value propositions	Z	H	H	Z
3. Channels	Z	H	H	Z
4. Customer relationships	L	H	L*	L
5. Revenue streams	H	L	L	H
6. Key resources	H	L	H	L
7. Key activities	L*	L*	H	Z
8. Key partners	L*	L	H	L
9. Cost structure	H	Z	Z	H

Following Kline (1994), the criteria used for specifying the relative importance of each variable to the dimensions is as follows: high (H; $x > .6$), low (L; $.3 < x < .6$), zero (Z; $x < .3$); x = loading.
Note: L* – these variables were on the cusp of loading high on the respective PCs.

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