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Constructing a Business Model Taxonomy: Using statistical tools to generate a valid and reliable business model taxonomy

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Abstract

Purpose: The paper proposes a research design recipe capable of leading to future business model taxonomies and discusses the potential benefits and implications of achieving this goal.

Design/Methodology/Approach: The paper provides a review of relevant scholarly literature about business models to clarify the subject as well as highlighting the importance of past studies of business model classifications. In addition it reviews the scholarly literature on relevant methodological approaches, such as cluster analysis and latent class analysis, for constructing a business model taxonomy. The two literature streams combined to form the basis for the suggested recipe.

Findings: The paper highlights the need for further large-scale empirical studies leading to a potential business model taxonomy, a topic that is currently under-exposed even though its merits are highlighted continuously in the contemporary literature. However, the research stream in relation to a business model taxonomy also needs a sound starting point in order to ensure valid and reliable outcomes. In this paper a research design for conducting such studies is presented and obstacles, which need to be overcome to ensure the quality of business model taxonomy studies in the future are identified.

Originality/Value: The paper highlights the benefits and potential implications of designing business model taxonomy studies and makes the case for ensuring the quality of future studies relating to e.g. performance. Reviewing the literature on both business models and methodological theories achieves this.

Keywords: classification, : Business model, Taxonomy, Research design, Cluster analysis, Theory development

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1. INTRODUCTION

The term business model has gained a lot of attention during the last decades from both scholars and practitioners (Zott et al., 2011). Many different definitions, concepts, ontologies and frameworks have emerged due to this attention, but today there are still none of these that have been universally accepted (Morris *et al.*, 2005, Zott *et al.*, 2011). The reason for this lack of agreement has also been debated. For this debate, some focus on the development of the term in different contexts depending on the researcher's interests (Zott *et al.*, 2011), while others focus on the different areas in business model literature, such as general definitions compared to generic business model types or specific company examples (Osterwalder *et al.*, 2005).

No matter the reasons, the result is that there is not a clear understanding of the term, and this lack of understanding creates both a challenge in discussing the existing literature as well as in forging the path for future studies. This context also raises the question about whether the goal is to have a unified definition of a business model or whether the multiple definitions, theories and concepts create more benefits than challenges. However, before this conclusion can be made, there is still an area in business model research that has not gained attention, although the potential benefits suggest that it should. This research has recently gained attention from Lambert (2006, 2015), has been named "business model taxonomy studies," and mainly gives an alternative methodological approach to research studies on business models.

However, it is not the main focus of this paper to discuss the relevance of business model taxonomy studies because Lambert (2006, 2015) has already done so comprehensively. Instead, the paper focuses on the next steps and presents a research design that can be used in these kinds of studies. In relation to the research design, there will be a discussion of general possibilities and implications of business model taxonomy studies. Thereby, the paper creates a more concrete starting point for doing these studies, which will potentially lead to and secure a higher level of quality because both the possibilities and implications are highlighted and discussed. Quality is an important aspect of the success of future studies because high quality of the research performed and the taxonomy developed is relevant to a discussion of how business models have been presented in these studies. Quality is also pertinent to a discussion of what business model studies should focus on in the future and may contribute to our understanding of the definition of business models as a whole.

The research design and the discussion of the possibilities and implication of such studies are based on the current academic literature relating to business models and scientific methods. Therefore, the paper will first give a short highlighting of the importance of business model taxonomy studies as, mainly, presented by Lambert (2006, 2015) and then present the proposed research design, in turn discussing each element and its possibilities and implications. The discussion is based on both current knowledge from contemporary business model studies and scientific methods aimed at establishing a taxonomy. Current studies in the business model area are mainly based on qualitatively oriented methodological perspectives, which differ from the quantitatively oriented methodological perspective presented in this article. Other studies, especially, marketing studies, are therefore found to be relevant to introduce into this context In marketing, a number of statistical tools are used to segment customers based on characteristics (variables) (Saunders, 1994), and these methods can be applied in relation to companies based on the characteristics of their business models.

2. THE IMPORTANCE OF BUSINESS MODEL TAXONOMY STUDIES

According to Osterwalder *et al.* (2005), business model theory can be divided into three different areas (see Table 1). The first area consists of the general, generic definitions, which can be found both as statements about what is a business model (Zott *et al.*, 2011, Magretta (2002), Casadesus-Masanell & Ricart, 2010) and as different generic frameworks (Osterwalder *et al.*, 2005, Morris *et al.*, 2005, Chesbrough & Rosenbloom, 2002, Alt & Zimmerman, 2001, Viscio & Pasternak, 1996). These overall definitions are often the focus in

discussions of what a business model is as well as used in relation to specific companies' business models.

Table 1 – Business model areas from Osterwalder et al. (2005)

Business model Concept	Definition – What is a business model? Meta-model – Which elements belong in a business model
Business model types	Taxonomy of types – Which business models resemble each other? Sub-(Meta)-models – What are the common characteristics?
Business model of …	Instances – View of companies Modelled instances Real world companies

The second and the third areas are often seen in combination, because the company examples are used to illustrate the generic business model types to create a better understanding of the generic types, e.g. Johnson (2010). The purpose of creating these generic types is ordering objects—hence companies—in groups based on their similarities, which helps describe the companies (Lambert, 2015) and thereby how different types of companies and business models function. It is therefore important to examine the different types of business models. Baden-Fuller and Morgan (2010) highlight that typologies are based on theoretical deductions, while a taxonomy is based on empirical induction.

To date, primarily only business model typology studies have been conducted (Lambert 2015). Such typology studies are based on deductive methods where the typologies are identified based on theoretical categorizations and/or qualitative data. Many studies have been performed with this research focus (Johnson, 2010, Bambury, 1998, Rappa, 2003, Chesbrough, 2007, Linder & Cantrell, 2000, Timmers, 1998, Betz, 2002, Zott & Amit, 2007, Weill *et al*., 2004). These different studies focus on various areas, e.g. comparison to real life companies, quantitative and qualitative data analysis, and also especially business model typologies in eBusiness.

By comparison are the studies called business model taxonomy studies presented both by Lambert (2015) and this paper. Taxonomy studies are based on inductive methods by which taxonomies are identified based on quantitative data. Many different variables and statistical tools, such as cluster analysis and latent class analysis can be used for finding natural groups in the data as opposed to using predetermined groups (Lambert, 2006). An important point is that the variables used in taxonomy studies are based on existing knowledge of business models based on typology studies. However, they are used differently due to different variables and the application of statistical tools. Lambert (2015) highlights the important features of the two kinds of research of business models in a table, which is presented below. The table also reflects the differences between the two.

Table 2 - Characteristics and functions of typologies and taxonomies from Lambert (2015)

Typologies	**Taxonomies**
The product of essentialist philosophy	The product of empiricist philosophy
Categories (types) are conceptually derived	Categories (taxa) are empirically derived
Few characteristics considered	Many characteristics considered
Reasoning by deduction	Reasoning by inference
Mostly qualitative classifications	Quantitative classifications
Monothetic groupings	Polythetic groupings
Specific classification	General classification
Provides a basis for only limited generalizations	Provides a basis for wider generalization

As emphasised in Lambert (2015), studies of business model taxonomies have been missing in business model research. This is worrying, as they provide important insights to be used in future research on business models and furthermore contribute to the discussion of what a business model is and is not. Business model taxonomy studies need large amounts of variables and data and should focus on identifying natural groupings in data by applying statistical tools. This means that the output is unknown in advance, but is identified via the data using statistical tests rather than the individual researcher's expectations of the findings. However, this being said, the individual researcher might still influence the outcome of the research to some extent through the choice of variables and statistical tools. Instead of random theoretically founded categorizations a well built and statistically valid taxonomy has the potential of leading to business model configurations applicable for multiple purposes instead of only specific purposes as in the case of the outcomes of parallel business model typology studies.

Several prior studies use the term "business model taxonomies" as a description of the output (the types) (Lambert, 2006), but from the correct definition of the term, only two studies, namely Bigliardi *et al*. (2005) and Malone *et al*. (2006), actually use the described approach correctly. Furthermore, there are still to date no studies that empirically derive a business model taxonomy based on criteria for classifying business models and which at the same time are relevant to multiple sectors (Lambert, 2015). Despite the potentials in establishing an empirically based taxonomy of business models the lack of this research means that there are not many studies to seek inspiration from or to provide a starting point for future business model taxonomy studies. Instead inspiration may be sought from other sources in order to highlight the necessary methodological considerations and possible pitfalls.

3. RESEARCH DESIGN FOR FUTURE BUSINESS MODEL TAXONOMY STUDIES

Our proposed research design consists of five building blocks that describe the areas or phases necessary for conducting the research. The five areas are separate parts of the research design, but they are still highly correlated, and together they create a starting point for future business model taxonomy studies. The five building blocks of the research design can be seen in Figure 1.

Figure 1 – Five areas in the research design

3.1 GENERAL CONSIDERATIONS IN RELATION TO SURVEYS

A clear purpose is crucial for the value of the research because it determines the use of potential survey data and drives decisions regarding survey design (Van der Stede *et al*., 2007). The purpose of future studies of business model taxonomies can be different. Some studies will focus on testing which variables should be used to describe what a business model is, while other studies might focus on testing the different business

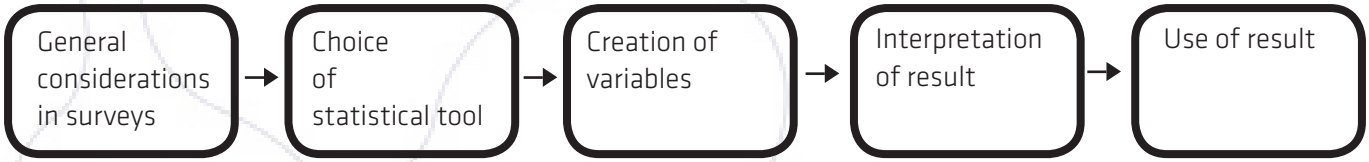

Figure 1

model configurations found in the first studies in relation to control variables such as performance, size, etc. (see different types of studies in Lambert, 2006). Van der Stede et al. (2007) provide a general overview on surveys and have compiled a list of considerations regarding survey design.

First, we need to consider whether the survey is a cross-sectional study or a longitudinal study? Longitudinal studies look at developments, whereas cross-sectional studies take at snapshot (Van der Stede *et al.*, 2007). It is important to include in the considerations that a company's business model is not a static concept—cf. Nielsen & Lund (2013)—and it can therefore change over time. Longitudinal studies should therefore be made if the purpose of the study is to look at the development in or of business model configurations over a time period, e.g. to make generalizations about this perspective. If the purpose is a snapshot at this precise moment in time, then cross-sectional studies are relevant.

Secondly, should the study focus on a variety of industries or only one (Van der Stede *et al.*, 2007)? Some studies will be related to specific industries, and therefore it will be necessary to consider if one or more industries should be considered. According to Zott et al. (2011), a business model is a new unit of analysis that is different from industries. Therefore, the studies will not generally have a demand to focus on specific industries. The industries can however be used as a control variable to make it possible to analyze the relation between industries and business models and how certain business model configurations might spread to new industries over time.

Thirdly, what should be the level of analysis? The level of analysis can target individuals, groups, companies etc. According to Van der Stede *et al.* (2007), it should involve multiple respondents on different levels because it is believed that a single respondent cannot represent an entire company's opinion (Young, 1996). Business models are related to a company, so the company will often be the level of analysis. It is, however, possible, especially with bigger companies, that more than one business model is in used at a given time, and the level of analysis could therefore be Strategic Business Units (SBU) in the company with a single business model.

Van der Stede et al. (2007) advises that at company level, more respondents should be involved to optimize the result and minimize subjective valuations about the company's business model. However, it depends on the extent and the purpose of the study because extra resources are required to collect data from more respondents.

Fourthly, who is the population? The population consists of all of the elements that will form the basis of the generalization (Van der Stede *et al.*, 2007) and will sometimes be a part of the purpose, and other times not. The delimitation can be related to geography, size, industries, or something else. The population is important for selecting the sample. An analysis of the whole population will often be a too comprehensive a task, and instead samples are used. One of the biggest challenges in data collection is to collect a sample that is a representative part of the population (Van der Stede *et al.*, 2007). A representative sample is a sub-part of the population that highly reflects the characteristics of the population (Van der Stede *et al.*, 2007).

Some actions can strengthen the representative of the sample by focusing on the validity of the study. The external validity is strengthened through probability samples and samples that are of a certain size (Van der Stede *et al.*, 2007). This is not to suggest that probability samples always are better than non-probability ones or that a larger sample is always better than a smaller one. The internal validity is strengthened by increasing the response percentage and giving the respondents incentive to answer the questions truthfully. Non-response errors are reduced by increasing the response percentage, which in turn strengthens the representativeness of the sample, because the respondents then reflect the whole sample (Van der Stede *et al.*, 2007).
It is also possible to test for non-response errors. According to Armstrong & Overton (1977), there are three different methods used to test for non-response bias, and the best and easiest method is called extrapolation. The method is built on the supposition that those who answer the questionnaire late are more similar to those who have not responded, because they are less willing to answer the questionnaire than the first group who answers (Armstrong & Overton, 1977). The internal validity is also about how truthfully the respondents

answer and therefore whether incentives should be offered for the respondents to answer truthfully. The constructed validity is strengthened through well-cosidered and tried questions. All in all, the quality and validity should be weighed against how many resources should be used in the research.

The considerations above are all considerations that should be done at the start of every questionnaire in studies regardless of whether the study is concerned with developing a business model taxonomy or not. These general considerations strengthen the credibility of the final results and give others the possibility to the test the research design.

3.2 CHOICE OF STATISTICAL TOOLS

The choice of statistical tools could in principle be a part of the design of the study, because choice of method is significant for how the variables should be designed. However, other methods can be chosen afterwards and be used with the same variables. Choosing a method in advance makes it possible to design the study according to that choice. The choice of method is also connected to the purpose of the study, because the different methods are fitted to the different purposes. In the previous section, two different purposes were described. One purpose was to find the variables that make up the business model and different business model taxonomy types. The other purpose was to take the business model configurations or a taxonomy found in the first purpose and test them in relation to other variables such as performance, size, etc. to find connections.
For the first purpose, statistical methods for segmenting companies based on variables describing the business model are central. Inspiration for these statistical methods can be found in the marketing literature as well as in the general literature on statistical modeling. In the marketing literature, customers are segmented based on variables which describe their different perspectives, but the methods used in these studies can also be used to segment products, markets, companies and business models (Saunders, 1994).

Dillon & Mukherjee (2006) divided the choice of statistical tool into three parts. The first part concerns whether the result should be decided a priori or later in the analysis. The statistical tools that are used in deciding the result a priori do not meet the requirements of business model taxonomy studies, but they can instead be used in business model typology studies such as those of Zott & Amit (2007) or Weill *et al.* (2004). The second part concerned with whether the result should be descriptive or predictive. Based on the definition of business model, taxonomy studies will focus on descriptive results for the first purpose and then will examine the relationship between variables for the second purpose.

The last part concerns whether the respondents should be divided 100 percent to each group (business model configuration type) or have an affiliation in all groups with a percentage between 0 and 100. According to the presented definition of a business model taxonomy, both choices can be used and will therefore highly depend on the purpose. For this paper, the focus will be on dividing the respondents into one group, and a statistical tool that abides by all the three parts and able to do this is cluster analysis. Other statistical methods could also be used, e.g. Latent class analysis, but this paper suggests using cluster analysis because it is easy to understand, easy to use, and is available in most statistical programs.

Cluster analysis is used to create groups based on natural groupings in the data based on many different variables instead of creating the groups based on predetermined expectations. Cluster analysis is therefore apt to the first purpose. The goal of the cluster analysis is to create groups in which the respondents (here business models) are similar to each other but at the same time are different from the respondents in other groups (Tan et al., 2006). Cluster analysis can be divided in two groups, hence hierarchical and non-hierarchical cluster analysis.

In hierarchical cluster analysis, an allocation of a respondent to a cluster (group or taxonomy) is irreversible, which means that when a respondent is allocated to a cluster, then the respondent is not removed from

that cluster again. It begins with "n" number of clusters, where "n" is the number of respondents, and next two clusters or respondents are put together in clusters until there is only one cluster (Dillon & Mukherjee, 2006). The procedure does not create one final result. It is the researcher's task to decide what are the best results and the optimal number of clusters (Meyers *et al*., 2013).

Here there are two important aspects to consider. The first is about how to identify the distance between the respondents, where the distance describes the similarities between the respondents and is based on different algorithms. The distance methods Euclidean distance and Manhattan distance are generally seen as good methods (Tufféry, 2011, Saunders, 1994), but also Squared Euclidean distance is seen as a good method (Meyers *et al*., 2013).

The next aspect is about how to link the respondents, and different methods for linking can be chosen (Meyers *et al*., 2013). In relation to linking methods, two methods have proven to be best, Average Linkage and Ward's method (Punj & Stewart, 1983). Especially, the choice of linking method is seen as important in relation to how good the result of the analysis gets (Punj & Stewart, 1983), but the single study can also have influence on which methods are best to use. Meyer *et al*. (2013) therefore recommends trying different methods in combinations to see which are best.

In non-hierarchical cluster analysis, the allocation of respondents to clusters is reversible. This means that the affiliation to one cluster is not final until the analysis is completely done. This is done to optimize the clusters so they are as comprehensive as possible. There are different types of non-hierarchical cluster analysis, and one of the most popular is K-means (Meyers *et al*., 2013). K-means starts with identifying "n" number of clusters and a related central point, which is based on all "n" dimensions (depends on the number of variables) (Tan *et al*., 2006). The most important aspect is that the number of clusters and central points be well chosen so they are far from each other in relation to the variables, because they are the starting points for the opening clusters (Meyers *et al*., 2013). The data should therefore be standardized to prevent outliers from being starting points (Meyers *et al*., 2013). The clusters are formed by taking the respondents one by one and allocating them to the clusters (in the beginning it will be the central points), which are the closest (the least distance). A modified centroid method is used for calculating the distance. The respondents and clusters that have the least distance between them will be joined in a new cluster (Meyers *et al*., 2013, Tan *et al*., 2006). There are two possibilities when a respondent is linked to a cluster. The first possibility is that the central point of the cluster is recalculated every time a new respondent is added.

This method is not recommended by Meyers *et al*. (2013) because the structure of the analysis and the order of the respondents will implicate the result; however, Tan *et al*. (2006) highlight some of the advantages of using this method, e.g. better accuracy and faster convergence, because it weights the value of each respondents, but also highlights the fact of the higher dependency of the order in the variables (Tan *et al*., 2006).

The other possibility is not to update the central point for the cluster every time a new respondent is added, but instead the central point is the original central point. The central points are instead updated when all the respondents have been added to a cluster, which is followed by one more round, when the respondents are replaced to the nearest cluster based on the new central points. This is done until the large distance is smaller than a threshold value set before starting the analysis or until the number of repetitions, which is specified in advance by the researcher, is reached (Meyers *et al*., 2013).

Both hierarchical and non-hierarchical cluster analyses are relevant, but the two kinds of cluster analyses each have their own strengths and weaknesses. A two-step method is suggested (Punj & Stewart, 1983, Ketchen, 1996) by which the advantages from both are used. The advantages of hierarchical cluster analysis are that the number of clusters is not stated a priori, and it is the same for the starting points of the analysis. The advantages of the non-hierarchical cluster analysis are that studies show that the method is superior compared to hierarchical cluster analysis methods (Punj & Stewart, 1983). A combination of both methods can therefore give a better result when the result of the hierarchical cluster analysis is used to find the number

of clusters and starting points for the non-hierarchical cluster analysis, which creates the final results.

The cluster analysis can be used for studies with the first kind of purpose, but for examining the relations between the business models (result of the cluster analysis) and other variables, other statistical methods are necessary. Several different types of statistical tools exist that can examine the relations between variables, and an example of a tool is shown in Zott & Amit (2007)'s study which used ANOVA to test the relation between business model typologies and performance. The statistical tools could also be cross tabulations or different kinds of non-parametric tests. Each statistical tool has its own procedure, and it is not possible to determine which tool is best, because it is highly dependent on the study. However, for all of the tests, once a method is chosen, then further method choices should not be made, unlike when the cluster analysis used and there are choices about distance and linking methods.

3.3. CREATION OF VARIABLES

A central part of the future studies will be the creation of those variables, hence questions and scale, that are a part of the analysis, Again, this process is highly related to the purpose of the study. In relation to the second purpose, it is possible to base the variables on previous studies' creation of variables (business model types from studies with the first purpose or studies about variables, such as size, performance etc.), but in studies with the first purpose, the variables are unknown, because the variables describe the companies' business models, and the variables should instead be created from the current knowledge about business models. The two purposes will not only demand different statistical tools but also different variables as well as different approaches to these variables.

For variables in relation to the first purpose, it is relevant to look at both questions and scale. These two parameters are related, because the creation of questions highly affects which scale should be used, and in the same way, the variables are connected to the choice of method. Non-hierarchical cluster analysis can only be used on ratio or interval scaled data, whereas hierarchical cluster analysis also can be used on binary data. Ratio or interval scaled data are therefore necessary to make an analysis based on a combination of both kinds of cluster analysis.

The questions are crucial for the result of the cluster analysis, because the clusters are formed based on the variables. The questions are still an undefined area, and the researchers must therefore examine data using as many variables as practical and necessary (Lambert, 2015). An alternative to the purely inductive method is to seek knowledge for variable selection (Ketchen, 1996). A large number of variables are still necessary; however, knowledge and a starting point for creation of these variables can be found in the existing literature, hence the existing business model literature.

Many of the current studies use a systematic approach to business models and can in spite of the use of a deductive methodological approach be used in forming variables. Especially, business model frameworks should be used as a starting point for the questions instead of the literature concerning general definitions of business models. The reason for this is that the variables are already defined, and the overall definitions are not comprehensive enough to be used in the creation of variables. The overall definitions should instead be used as a guide for the creation of frameworks and variables.

For example, the four points from Zott *et al.* (2011) provide an ideal background for making the variables because most studies agree on these four points. Firstly, a business model is a new unit of analysis that is different from company, product, industry and network. Secondly, a business model focuses on a holistic approach to describe how companies do business. Thirdly, activities both in and between the company and its partners are central in the business model. Fourthly, a business model focuses on describing both value creation and value capture. However, these four points are not precise enough to start making variables, and therefore frameworks, e.g. Osterwalder and Pigneur (2010) or Chesbrough and Rosenbloom (2002), may be a good starting point.

A recent contribution by Tweedie *et al.* (2015) argues

that useful frameworks for identifying relevant business model components include the two abovementioned as well as seven other frameworks from a variety of different fields such as accounting (Bell *et al*., 1997; Haslam *et al*., 2012), strategic management (Demil and Lecocq, 2010; Kaplan and Norton, 2001) and innovation (Chesbrough, 2006; Johnson *et al*., 2008).

Another perspective in the business model literature is business model types, hence typologies and taxonomies. There is a natural coherence between typologies and taxonomies (Baden-Fuller and Morgan 2010), and the business model typology studies should therefore be used in the creation of business model variables. Knowledge from business model typology studies can be used to create the answers to the overall questions, and typologies and taxonomies can be compared in relation to similarities and differences that may help foster future studies, e.g. Johnson, 2010; Chesbrough, 2007; Linder & Cantrell, 2000.

The methodical approach in business model taxonomy studies gives an opportunity to focus on more variables and a broader perspective of variables; in other words, instead of only focusing on the Internet's role in the establishment of eBusiness-based business model taxonomy, this role could be just one part of more variables. The method creates the opportunity to define the two concepts differently and test the relationship between all these definitions, in this way getting closer to a more clear definition and more distinct differences between these two concepts. However, this methodology is also open to potential pitfalls.

One of these pitfalls is that variables unrelated to describing business models could be mixed into the analysis and be seen as part of the business model even though from a logical point of view they do not make sense. This is of course not the intention or will not serve to create high quality in the study or a greater understanding of business models; instead it will create mistrust of the result and discussion in general. It is therefore highly important to be selective when choosing the variables, but at the same time be open-minded to potential aspects that can be a part of company's business model.

Again, the backbone of the variables should be found in the general definitions of business models, where business models are described determined by the business function or related to the four points presented by Zott *et al*. (2011). Another point to differentiate the relevant areas from the irrelevant areas is to follow Casadesus-Masanell and Ricart (2010)'s definition of a business model, where a business model consists of two things: (1) a set of choices and (2) the set of consequences derived from those choices. This is similar to understanding what a business model is by how the business works and its choices and their respective consequences.

Another potential pitfall can be that the authors of the existing business model studies and frameworks will not use the new method as intended and the advantages of the inductive method but will instead fall back to their own business model concepts that are based on the individual researcher's own mind. One way to overcome this pitfall is to base the variables on knowledge from more than one study, e.g. from several frameworks.

Here, the areas in the frameworks can be used as inspiration for testing differences as well as new concepts. In this way, the ideas from different deductive studies can be used in combination with testing the right variables just as Zott *et al*. (2011) derived the four points that are common in most business model definitions. This can lead to investigating variables as service, employee, and customer engagement as in Heskett *et al*. (1994), together with value proposition, market segments, value chain, etc., as in Chesbrough and Rosenbloom (2002).

In Table 3, an overview of a number of different frameworks can be seen. A lot of the frameworks focus on similar areas, and the differences should therefore sometimes be seen in the details and in the ways the areas are put together because the relationship between the areas are important. However, the studies presented in this paper provide more room for examining different minor details and seeing what the differ-

Tabel 3 – Business model frameworks

Heskett et al. (1994)	**Bell et al. (1997)**	**Chesbrough & Rosenbloom (2002**	**Linder & Cantrell (2000)**	**Petrovic, Kittl et al. (2001)**
- Employee engagement - Customer engagement - Creating sustainable profit and growth	- External forces - Markets - Strategic management processes - Core business processes - Alliances - Products and service - Customers	- Value proposition - Market segment - Value chain - Cost structure and profit potential - Value network - Competition strategy	- Sources for revenue - Value proposition - Key factors – delivery - Most important assets, abilities, relationships and knowledge	- Value model - Resource model - Production model - Customer relation model - Revenue model - Capital model - Market model
Alt & Zimmerman (2001)	**Gordijn et al. (2001)**	**Dubosson-Torbay et al. (2001)**	**Kaplan & Norton (2001)**	
- Mission - Structur - Processes - Revenue - Regislation - Technology	- Actors - Value objects - Value entrance - Value interfaces - Value trading - Value proposition - Market segment - Composite actors - Value activities	- Products and services - Customer relationships - Infrastructure and partner network - Financial aspects	- Financial - Customers - Internal business processes - Learning and growth	
Betz (2002)	**Mouritsen et al. (2003)**	**Morris et al. (2005)**	**Osterwalder et al. (2005)**	
- Resources - Sale - Profit - Capital	- Knowledge sharing - Management challenges - Initiatives - Indicators	- Value proposition - Market - Internal Capacities - Competition strategy - Economical factors - Growth/exit possibilities	- Value proposition - Customer segment - Customer relationship - Delivery channels - Activities - Resources - Partners - Revenue streams - Cost	

Business model variables also consist of the scale by which the questions are measured. Several scales can be used depending on the questions, and the choice of scale relates greatly to the cluster analysis because the methods in these are based on calculation of averages. The optimal scales are therefore ratio or interval scales. At the same time, it should also make sense to measure on the scale that is used. In hierarchical cluster analysis, it is also possible to use binary data, which opens the possibilities to use yes/no questions as well as the use of categorical variables, if these are recorded as dummy variables. However, there is a disadvantage when using binary data, because the result of the cluster analysis can be hard to interpret in relation to the averages. It is hard to interpret averages that are not very close to either 1 (Yes) or 0 (No), because intervals are not used, but only these two extremities.

An average of 0.5 for a variable in a cluster means that the opinions of the respondents are split, but an interpretation of the 0.5 is not possible in relation to the two categories, and at the same time, an interpretation in the middle does not make sense either. It can therefore create problems if some variables have this average. Ratio and interval scaled data are therefore to be preferred, but the choice depends on the questions and how they are created and which variables are appropriate for measuring them. The most important thing is that there is coherence between the question, scale, and statistical tool and that the question and the possible answers make sense, because this makes it possible for the respondent to understand the question and respond truthfully.

The variables used for studies with the second purpose can be divided into two parts. The business model variables, which come from studies with the first purpose, can be used to analyze the relations in the first part, where the relationships between the variables, which constitute the a business model taxonomy, are analyzed. Therefore, the same variables used with other purposes will enable the study of both within-group and inter-group relations (Lambert, 2015). In the second part, the relation between the formed business model variables and other variables are therefore analyzed. These other variables can be performance, size, section, etc., and they are used to test the relation between these factors and the business model taxonomy. While the variables for the business model can be found in studies with the first purpose, the other variables are highly used in other studies, which make it possible to draw on knowledge from them.

Hansen & Van der Stede (2004) have for example made a study about variables that can measure performance, because performance is not easy to observe and should be made as a latent variable. The analysis for the second purpose can also draw on knowledge from contingency studies, e.g. Chenhall (2007), which examines how variables such as size affect performance. Overall, all the variables for the second purpose are based on variables from first purpose, the business model taxonomy, or other variables with knowledge from previous studies. The scales are also important to focus on, because the methods have different demands for scales; for example, ANOVA is based on calculation of average, which makes it necessary to either use ratio or interval scaled data.

3.4. INTERPRETATION OF RESULTS

Results will come from the statistical analyses in the studies. These results may, however, be of very different nature, and interpretations of them might differ depending on the purpose and thereby methods used. Cluster analysis does not create a final result, but instead it creates a choice between optimal results based on the possibilities presented from the analysis. This applies especially for hierarchical cluster analysis, where "n" possible cluster analysis solutions are created, where "n" is the number of respondents. However, the choice between different solutions, based on the use of different input in non-hierarchical cluster analysis, does not give a final interpretation of which result is best.

It is instead the individual researchers' own interpretation of which result is best that determines the final solution. However, it is possible to use more systematical approaches for interpreting the result, hence

looking at variances (Malhotra et al., 2012) and homogeneity or heterogeneity between clusters (Sharma & Kumar, 2006). In the end, there is not a definite rule for interpretation, but it is instead a weighing of the different methods, the purpose of the study, and the researcher's intuition. This also highlights the importance of using different method combinations in hierarchical cluster analysis and different starting points for the non-hierarchical cluster analysis. It also highlights the importance of performing different studies with the same variables but different interpretation methods and researchers.

In this regard, the studies with the second purpose are easier to interpret, because the result for the most part is fairly clear. Even though different statistical tools may be used, the method of application is the same. First, a hypothesis is made, which is later tested in relation to whether it may be rejected and thereby indicate if there is a significant relation between two or more variables. It is thereby not as much interpreted by the individual researcher's intuition.

3.5. USE OF RESULT

The use of the results for future studies highly depends on the purpose of the study, because the result should address the study's purpose. The use of the result will be different for the two kinds of studies, because they have different purposes. Lambert (2006) has made some general possibilities for result usage in the studies with two purposes, especially with a focus on using deductive and inductive studies in interaction to create business model theory. In this context, the results can be used to understand what a business model consists of and to build a business model theory. Furthermore, it can give valuable input to what a business model is and is not. It is, however, an interactive process by which new results can create more knowledge and support the existing knowledge.

4. RESEARCH DESIGN FOR THE TWO PURPOSES

Together the five areas described above create a research design for the two different purposes, namely 1) identifying the variable that make up a business model taxonomy and 2) testing a business model taxonomy in relation to performance, size and relations. (see also Table 2). The research design gives an overview of the areas that are relevant in future studies to secure the quality and the applications of the study. The research design is the same overall, but it gives general guidelines that can be used on all the possible different purposes.

Table 4 – Research Design with main features

	First purpose – identifying a business model taxonomy	**Second purpose – testing a business model taxonomy**
General considerations in relation to surveys	Purpose, design, population, sample and validity	Purpose, design, population, sample and validity
Choice of statistical tool	Cluster analysis Hierarchical (distance and linking methods), non-hierarchical (number and central points), combinations	ANOVA, Cross tabs or other
Creation of variables	Existing business model literature – creation of new variables	Variables or results from the first purpose or other variables based on other studies
Interpretation of result	Intuition and/or systematical methods	Rejection of hypothesis
Use of result	Improvements of conceptualizations or use for the first purpose	Improvements of conceptualizations or starting point for creation of theory

There are some issues that should be overcome in relation to future studies to secure the quality of the studies moving forward in terms of validity and reliability. The biggest issue concerns creation of the variables, which should be used for the first purpose. These variables should be based on the existing knowledge from other business model studies, but both questions and scales should also be created with a focus on the statistical possibilities. Therefore, there should be more focus on creating these variables possibly through many more studies of a business model taxonomy until satisfactory results have been produced. However, if satisfactory variables are created, then the biggest issues are also overcome, and useful results can be produced.

5. Conclusion

Studies of leading to a business model taxonomy in which inductive methods and statistical tools are used to identify business model types, are still relatively new ground. This entices a need for knowledge about how to start the research process and how quality can be secured in future studies. The first purpose of the research design suggested here is to find the variables that make up the business model and can lead to the identification of a business model taxonomy. The second purpose of the research design is to take the identified business model taxonomy from the first purpose and test it in relation to other variables such as performance, size, etc. to find significant relationships.

To meet this need, a research scheme that can be a starting point for future studies of a business model taxonomy has been introduced in this paper. Its purpose is to contribute to a greater and more common understanding of business models. The research design consists of five areas, each of which is essential for creating quality in future studies. The future studies of a business model taxonomy can be divided into two parts that each have their own relation to the five areas in the research design, but the five parts in the research design can give overall guidelines for future studies.The first area includes general considerations in relation to surveys. These considerations create quality in the data that are collected and that are essential for the studies. The second area is the choice of statistical tools. Business model taxonomy studies highly depend on statistical tools for data treatment, and the choice of statistical tools is therefore essential. The two different kinds of future studies demand different choices in statistical tools depending on the purpose of the study, hence the segmentation of companies according to their business models (statistical tool, e.g. cluster analysis) or examination of relations (statistical tool, e.g. ANOVA or cross tabs). The third area is the creation of variables. Again the two kinds of studies have a demand for different kinds of variables.

Variables, which describe the business model, are used for the purpose of segmentation. Even though there are many studies of business models, one of the biggest challenges is identifying and creating these variables, because there is no contemporary common consent about what a business model is or which statistical tools, questions, and scale should be taken in to account in the creation of variables. This issue is due primarily to the lack of studies in these areas, and the starting point for creating the variables should instead be based on current knowledge, which should be converted to variables. The variables that should be used to examine relations between variables can either be the variables from the segmentation or other variables based on previous studies, such as studies about performance variables. Pitfalls such as the possibility that researchers will fall back into old habits may exist. Identifying variables on the basis of more than one current study and making sure only to include relevant variables can overcome this risk.

The fourth area is the interpretation of results. The results of the cluster analysis can be interpreted based on the researcher's intuition or based on more systematical approaches; whereas the test of relations gives a final result. Another issue is therefore the interpretation of the result, which only can be accomplished by conducting more studies. The fifth area is the use of the results, because the result should not only be seen in its own narrow perspective and purpose, but also as a part of the knowledge contributed by all business model studies. Both the future and current studies of business models with their different approaches create the opportunity to develop business model theory, but for this development to occur, it is important to start focusing on the yet undiscovered area of a business model taxonomy.

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