Theories for classification vs. classification as theory: Implications of classification and typology for the development of project management theories

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Abstract

Although ordering and classification schemes play a crucial role in the project management field, classification as a topic of study has been undervalued in the literature. Accordingly, there is a semantic confusion and lack of uniformity about the definitions and theoretical implications of two commonly used terms in project management: classification and typology. We argue that this issue hinders project management field from developing middle-range theories and flourishing theoretically compared to other fields of research.

In this paper, we clarify the definitions and theoretical implications of project classification and typology so they can be fully used in theory development. We argue that typology – although it involves classification – is different than simple classification schemes. We also explain how theories for classification can be used to delimit project types in homogeneous project categories and develop middle-range theories; however, a typology itself is a unique form of theory that can capture the complex nature of projects. By clarifying these concepts, this paper points to promising directions for future development of theories in project management.

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1. Introduction

Since the earliest development of modern theories of project management, which Morris reports as having emerged in the 1940s and 1950s (Morris, 1994), the classical project management literature has advocated a universal theory of and approach to project management, under the assumption that all projects have the same structures and processes. However, Shenhar (2001) suggests that there is no single “theory of project management”, and there is little evidence in practice that an ideal model exists for all project types (Cicmil and Hodgson, 2006). Moreover, several other prominent authors (Koskela and Howell, 2002a; Maylor, 2001; Morris et al., 2000; Winch, 1996) have emphasized the need to introduce alternative theoretical approaches to the study of projects instead of searching for a single project management theory. However, only a few studies have examined the behaviour of projects in theoretical terms (Lundin and Söderholm, 1995; Söderlund, 2004, 2011b). That is a major reason why the project management literature “suffers from a scanty theoretical basis” (Shenhar and Dvir, 1996, p. 607).

Nonetheless, the discipline has developed some building blocks to help shape its theoretical foundations (Jugdev, 2008). Many schools of thought/perspectives have been introduced, and these vary in terms of how they look at the nature of projects and the type of theorizing they engage in (Bredillet, 2007b; Söderlund, 2011a; Turner, 2006a; Winter and Szczepanek, 2009). Although the existence of these diverse views shows that pluralism is growing within the field, Söderlund (2011b, p. 57) argues that that “too much fragmentation hinders the communications among scholars.

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and ultimately leads to failure of knowledge sharing and accumulation”. He concludes that some kind of unification is also necessary in order to better understand the phenomenon under study and improve the language that we use to speak about our common cognitive problems.

The suggested unification of theories implies that project management theorists must be explicit about the project types that they are theorizing about, regardless of the theoretical schools of thought/perspectives they apply, the problems concerned or the different phases of the project life cycle examined (Söderlund, 2004, 2011a, 2011b). Limiting the theoretical scope to a particular project type is a remedy for a major problem in constructing sound project management theories that has been described as a lack of distinction among project types (Pinto and Covin, 1989). Moreover, by limiting the scope of the work to specific project types, the project management principles, tools and methods applied are also tailored to the types of projects (Andersen, 2006; Besner and Hobbs, 2004; Turner and Cochrane, 1993). In other words, in the current theoretical landscape of project management, there is a need for more middle-range theories (Packendorff, 1995). Middle-range theories (Merton, 1968) are expressed in similar terms to traditional theories but their scope is limited to a single project type. Nevertheless, a review of the studies that used some sort of project classification reveals two major issues, which we believe are preventing the project management field from fully addressing the need for middle-range theories.

The first issue is the neglect of the essential role of “classification” in delimiting project types. By using a proper classification and construction of homogeneous categories, projects that share a certain degree of similarity in terms of specific features can be considered as a project type. However, this critical step in development of middle-range theories has been overlooked in the project management literature. Although a variety of classification schemes have been used in the corpus of studies (Crawford et al., 2005, 2006), compared to other disciplines, little systematic research has been conducted on project classifications as a separate topic of inquiry. While various project classification schemes have been developed based on in-depth knowledge of projects, few seem to have been drawn based on established theories or explicit classification principles.

The second issue is the inconsistent use of “classification” and “typology” across authors in the project management literature. These two important terms are frequently misunderstood and/or used interchangeably. In particular, there is much confusion about the definition and theoretical implications of “typology”. That is why some proposed project typologies are simply classification schemes that present certain mutually exclusive project categories but are not developed into a standard, fully accepted theoretical typology (Doty and Glick, 1994). For example, Evaristo and van Fenema (1999) developed a project classification scheme based on the emergence and evolution of new forms of projects but did not develop it into a typology. Similarly, Blismas et al. (2004) sorted clients’ construction portfolios into groups that exhibit similar traits, attributes, or origins, which is better regarded as a classification scheme and not a fully developed typology, which should present some ideal types and explain a dependent variable.

A major reason for this semantic confusion between classification and typology is that most project classifications were constructed heuristically or did not incorporate the progress made by the work of other scientists, in fields such as management and organizational science, who have worked on classification or typological principles for a long time. Given that we are still in the early stages of theory development in project management (Söderlund, 2004, 2011b; Yung, 2015), we believe that disregarding the theoretical implications of typology represents a missed opportunity and hinders project management from undergoing further theoretical development.

To address these two issues, we first clarify the definitions of classification and typology in order to alleviate the semantic confusion that reigns in most of the project management research literature. Because very few project management researchers have defined and discussed these terms, we look at other scientific fields, including the natural sciences and, most importantly, the disciplines associated with management and organizational studies. Our examination of the long history of discussions of classifications and typologies led us to some very influential authors and papers that have generated long and on-going discussions of these concepts. Therefore, our selection of authors was guided not by the criterion of exhaustiveness but by the criterion of relevance.

We will also discuss the implications of classification and typology for the development of theories in project management. We will argue that, with the help of theories for classification, significant aspects of a subject can be selected as the classification criteria and homogeneous categories can be constructed. Next, by building samples from a homogeneous project category, we will be able to delimit a project type and then test hypotheses and develop middle-range theories. This process would provide a guideline for specifying project types and lead to the development of more vigorous and reliable project management theories, albeit theories that are narrower in scope.

Further, we will discuss how the construction of a typology is a valuable and useful way to develop theories in project management. We explain that a well-developed typology must meet the most important criterion of being a theory (Doty and Glick, 1994). We reveal that a typological theory is not similar to traditional bivariate or interaction theories but is regarded as a unique form of theory that incorporates multiple levels of theory — a grand theory as well as multiple middle-range theories (Doty and Glick, 1994). We will argue that a well-developed project typology has the capacity to capture the complex nature of projects and the various causal relationships involved (Shenhar and Dvir, 1996, 2007). In summary, we argue that:

- Classification schemes are different from typologies.
- A proper classification is a core requirement for the development of middle-range theories.
- Typology itself represents multiple layers of theory.

The insights from this research have major implications for the further development of project management theories. First, highlighting the fundamental — but often forgotten — steps for devising middle-range theories would help project management scholars to generate additive knowledge in more unified, vigorous
and reliable theories, although the scope is limited to one project type. Second, we argue that developing a fully specified typology will be worthwhile, since typological theories are more likely to account for the complex, multivariate nature of many projects. By using the insights in this paper, future project management researchers can not only evaluate existing typologies for their current relevance but dig further into the new subject areas where new typologies can be constructed and tested. Overall, we hope that a clearer understanding of the definitions and theoretical implications of “classification” and “typology” in project management will lead to more ground-breaking theoretical contributions in the field.

This paper is structured as follows. In Section 2, we discuss the definition of classification and theories for classification. In Section 3, we discuss the definition of typology and how it is actualized in project management. In Section 4, we will investigate the implications of classification and typology for the development of theories in project management and discuss some promising directions for further research. Finally, in the conclusion, we highlight the contributions of this paper.

2. Classification

In the scientific literature, there are many definitions of the concept of “classification”. Some of the most common definitions are: “identification and assignment of organization forms to formally recognized classes” (McKelvey, 1978, p. 1428), an “information infrastructure that represents a spatio-temporal segmentation of the world” (Bowker and Star, 2000, p. 10) and “the sorting of objects based on some criteria selected among the properties of the classified objects” (Hjørland and Nissen Pedersen, 2005, p. 592). Broadly speaking, classification can be seen as the development of a classification scheme, which refers to a schema consisting of different classes and the relationships among them (Kwasnik, 2000).

Classification schemes demonstrate how entities are assigned to categories and how categories are differentiated from each other. We may consider the classification scheme as a set of boxes in which the entities in a class are sufficiently similar to each other while being sufficiently different from those in other sets of classes. Classification schemes are often depicted as hierarchical orders, tables, illustrations, or graphical representations (Kwasnik, 2000). The Periodic Table of Elements in chemistry and Darwin’s tree of life (representing the origin of species) are two well-known examples of classification schemes. Organizational and management researchers have a rich tradition of developing various classification schemes to fulfill different purposes (Carper and Snizek, 1980; Chrisman et al., 1988; Gordon and Babchuk, 1959; McCarthy, 1995; McCarthy et al., 2000; McKelvey, 1978; Perrow, 1972; Thompson, 1967; Van Ripper, 1966). These classification schemes are intended to enhance the knowledge and understanding of organizational and management-related phenomena.

Two points should be made here concerning terminology. First, classification is often used interchangeably with categorization. Indeed, in the majority of studies in natural science, management or organizational science, the two terms have almost the same meaning. However, Jacob (2004) differs in this regard, as he defines categorization as dividing the world into the classes and classification as pigeonholing entities into pre-defined classes. Nevertheless, like the vast majority of authors, we use these two terms with the same sense. We also use the verbs classify and categorize interchangeably.

Second, classification is also often used interchangeably with taxonomy (Miller, 1996; Rich, 1992). However, taxonomy is only one kind of classification (among many) for which the objects are classified based on statistical generalizations (e.g., factor analysis) or based on “similarity” (Hjørland, 2008). Rather than the perceived similarities of their features, entities can also be classified according to their perceived alignment with the classifier’s specific “goal”, “values” or “policies” (Barsalou, 1983) or “principles of pure reason and logic” or “study of context” (Hjørland, 2008). Nevertheless, regardless of how the classification has been constructed, there is some underlying logic or theory behind it. In the next subsection, we delve further into the possible logics behind the construction of a classification scheme: the theories for classification.

2.1. Theories for classification

In general, theories for classification1 are understood as theories or theoretical principles that can be used as a basis for classifying entities. Theories for classification distinguish between significant and trivial features of given phenomena and may introduce various principles and procedures for constructing the classification of particular entities. Hjørland and Nissen Pedersen (2005) contend that each theory for classification is domain-specific and each domain develops its own theories in order to describe, differentiate and classify objects. Each of these theories “sees” different aspects of a phenomenon; thus, each classification based on those theories is different. That is why a single entity may be classified differently by different researchers.

Biology and the natural sciences have pioneered in developing theories for the classification of species. For example, phyletics is a theoretical model of evolution, drawn mainly from the works of Mayr and Ashlock (1969) and Ross (1974), that classifies species based on the historical origin and evolution of lineages and species. Phyletics is divided into two main branches: evolutionary phyletics and cladistics. Evolutionary phyletics focuses on the degree of evolutionary similarity between branching points in order to form a class, whereas cladistics focuses on common ancestors (and not necessarily similarity) in order to place entities from different branches but with a common ancestor in the same class.

Although these biological theories for classification were intended to classify species, they are frequently applied to other fields such as organizational science, where they are used to classify organizational types. Some researchers in organizational science have used phyletics to classify organizations based on the

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1 In other fields such as information science, some authors may refer to the same concept as “classification theories” or “theories of classification” (e.g., Szostak, 2008; Hjørland and Nissen Pedersen, 2005; Hjørland, 2008). However, in this paper, we use “theories for classification” as we believe it bears more intuition to the theories or theoretical principles that can be used as a basis for classifying entities.
emergence and decline of different organizational forms over time (McCarthy, 1995; McCarthy et al., 1997, 2000; McCarthy and Ridgway, 2000; McKelvey, 1978). For example, McCarthy and Ridgway (2000) used cladistics to construct a seven-stage framework for classifying manufacturing systems. They assumed that manufacturing systems evolve into new organizational “breeds” over time and can therefore be explained by the theory of natural selection.

These examples of classification in biology and organizational science highlight the fact that some established theories, although not initially intended for purposes of classification, can still be used as the basis of classification (Hjørland and Nissen Pedersen, 2005). To enrich our discussion of the role of theories in classification, we would like to highlight some important points:

1. The value of a particular classification is determined by its alignment with the classifier’s purpose. Therefore, there is no such a thing as a universal classification (Hjørland and Nicolaisen, 2005). In some fields, certain classifications appear to be independent of human purposes. The periodic table in chemistry and physics is an example of this illusion. However, even in such cases, the classification has an implicit purpose (e.g., structural analysis of matter) based on the history of the field (Dupré, 2006). Each classification is appropriate for a particular purpose. For example, classification based on a “common ancestor” (cladistics) is appropriate for the purpose of explaining the evolution of a species (Dupré, 2006). However, if a classifier wished to speculate on the relationship between “heartbeat” and “animal size”, cladistic classification would not be very useful. In this case, a classification based on “animal size” may be more suitable.

Dewey (1948) notes that “each classification may be equally sound when the difference of ends is borne in mind”. That is why researchers in different fields may disagree about the value of different classification schemes (Hjørland and Nicolaisen, 2005). The same fundamental characteristic is true of project classification schemes; Crawford et al. (2005) argue that the success of project categorization is measured against how much it fulfils the initial classification purpose set by the classifier. That is why selection of project contingency factors may not always be an appropriate recipe for classification: it may simply not serve the classifier’s purpose. For example, a project classification scheme based on “complexity” may be a good recipe for an organization like NASA but may not be appropriate for an agency like a national postal service.

2. There is no neutral way of devising a classification, because each classification scheme, whether explicit or implicit, is ultimately derived from the classifier’s theories, perspectives and purposes (Hjørland and Nissen Pedersen, 2005). The selection of classification criteria is always influenced by the underlying theory, individual knowledge and expertise. Even in a well-founded classification theory such as cladistics, the classification principles are affected by the researcher’s preferences (McCarthy et al., 2000).

There is a (false) belief that statistical methods can create an objective classification scheme in the pure sense of being independent of individual perspective on reality. However, the choice of features to put into the statistical method is not just a “given”; it reflects both the entities’ characteristics and the classifier’s theoretical perspective/purpose (Fiegenbaum and Thomas, 1995; Hjorland and Nissen Pedersen, 2005; Ketchen et al., 1993; Miller, 1996). For example, in making use of statistical tools, non-governmental organizations may emphasize the “social effects” of projects in constructing their classification, whereas an engineering company may emphasize other properties such as “profitability” or “political risk.” In addition, each statistical method includes some prior assumptions that influence how it classifies objects. These assumptions are grounded on domain-specific theoretical perspectives. One of the assumptions in statistical methods is the “similarity measure”. Two projects may be “similar” to each other in many different ways. There is no neutral ground on which to choose; for example, should similarity be measured as the distance between the averages of each project feature? Or it should be measured by the difference among the trends in project features over time? We can see that even the choice of measure to be used for statistical classification remains debatable. Thus, developing a project classification with statistical classification methods (e.g., a project taxonomy), like all other project classification schemes, cannot be a neutral and purely data-driven process but is inherently purposeful and based on certain theoretical assumptions or views.

3. The theories for classification as referred to in this paper must be differentiated from “theories of cognitive science about classification”, which refer to the cognitive process in human mind whereby concepts and categories are formed and entities are included in or excluded from categories (Murphy, 2002). The cognitive process of classification is explained by theoretical views such as prototyping (Rosch and Mervis, 1975), the goal-based view (Barsalou, 1983) and the causal view (Rehder, 2003a, 2003b; Rehder and Hastie, 2001). These theories explain how the natural (cognitive) classification is constructed. However, theories for classification refer to the theoretical frameworks that dictate some rules for how the classification should be constructed. For example, by using cladistics to classify species, we apply certain rules based on evolutionary science to construct a particular classification scheme. However, the cladistic classification scheme bears no resemblance to how the human brain, whether a scientist’s or a layperson’s, would naturally classify species when simply observing nature.

3. Typology

Despite its widespread use, typology is often misunderstood as meaning the usual classification of entities. However, Doty and Glick (1994), pointed out that, unlike classification systems, typologies are not about sorting entities into mutually exclusive, exhaustive groups. Instead, typologies are conceptually derived interrelated sets of ideal types that explain a dependent variable. The typology is designed in such a way that the “fit” of an existing organization and the ideal types are believed to determine the relevant outcome, such as organizational effectiveness or success. Fig. 1 depicts the general view of how typology is developed.
Based on explanation of Doty and Glick (1994), the first step in constructing a typology is to identify some important dimensions of the subject as the first-order constructs. For example, based on his prior insight, Mintzberg (1973, 1979) used dimensions such as age, size, environmental uncertainty, and so forth as the first-order constructs for his typologies of organizations.

The second step in developing a typology is to specify some ideal types. Ideal types are multivariate profiles of entities summarized by specific variables known as second-order factors/constructs. Simply put, a combination of second-order constructs is used to describe the holistic configuration of each ideal type. For example, in an organizational typology, Mintzberg (1973, 1979) used some contextual and structural factors to introduce and describe five ideal types of organizations for his typology: entrepreneurial, machine, professional, divisional and innovative organizations. These ideal organizational types do not necessarily represent real organizations. However, actual organizations may be more or less similar to ideal types.

In constructing ideal types, researchers initially search for alignment, coherence, and interdependencies among features of entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979).

In constructing ideal types, researchers initially search for alignment, coherence, and interdependencies among features of entities and then combine the significant features to construct ideal types (Miller, 1990, 1996; Mintzberg, 1979). Alternatively, a researcher may set the “milestones” in first-order constructs as ideal types (Doty et al., 1993; Segev, 1989). For example, if we take “size” as a first-order construct, ideal type A can be set as the maximum possible value for “organizational size” and ideal type B can be set as the minimum value for “organizational size”. The other ideal types would be placed somewhere between those two endpoints. The researcher then uses second-order constructs to describe the constructed ideal types. Furthermore, empirical observations of trends in second-order factors can help the researcher to emerge or refine the description of ideal types along each dimension.

Finally, a typology predicts a specified level of a dependent variable by measuring the fit (or difference) between the second-order constructs of real entities (e.g., real organizations or projects) and those of ideal types. Accordingly, a typology predicts the consequences for the dependent variable of the deviation of actual entities from the ideal types. For example, Mintzberg (1973, 1979) hypothesised that the fit to his five ideal types of organizational structures should result in maximal organizational effectiveness (as dependent variable). Accordingly, the divergence between an organization’s second-order constructs and those of the ideal types would result in a loss of organization effectiveness. Another example is the typology presented by Porter (1980, 1985), who hypothesises that fit to his proposed ideal-type strategies will maximize an organization’s competitive advantage.

It should be emphasized that, in a typology, the measurement of deviation (or fit) between the profile of an actual organization and the ideal types does not rely on a single attribute but instead on the relationships and complementarities between multiple constructs that describe the organization and the ideal types (Fiss, 2011). Moreover, the ideal types should be comprehensive and mutually exclusive so that the typology will be valuable and remain robust over time (Snow and Ketchen, 2014). For example, although Miles and Snow (1978) developed their typology with a sample of 16 college textbook publishing firms, they argue that their ideal types (prospector, defender, analyser, and reactor organizations) are comprehensive and represent all of the organizational forms present in the industry. By demonstrating the existence of similar types of organizations in other industries, such as private hospitals, electronics firms, and food-processing firms, subsequent research has confirmed Miles and Snow’s typology’s comprehensiveness (Snow and Ketchen, 2014).

### 3.1. Typology in project management

Few studies in the project management field have claimed to have developed a typology for various dimensions of projects. For example, Griffin and Page (1996) developed a typology for “project strategy” with two dimensions – “newness to market” and “newness to the firm” – to predict a product development project’s overall success. In another example, Stock and Tatikonda (2000) presented a typology of “project-level technology transfer processes” with three dimensions: “uncertainty about transferred technology”, “organizational interaction between the technology source and recipient”, and “transfer effectiveness”. Accordingly, they argue that appropriate matches to their “transfer process types” represent the most effective approaches to technology transfer. Further, Mazouz et al. (2008) proposed a typology for public-private partnership (PPP) projects with two variables – “the proximity of the target” and “the capacity to generate projects” – that are believed to be relevant for the effective and efficient management of PPPs. Additionally, Kujala et al. (2010) also developed some arguments for the creation of a typology for solution-specific business models in project-based firms.

Although these typologies are valuable research studies in project management and provide useful theoretical insights, they did not explicitly demonstrate their conformity with the definition of a fully developed typology (Doty and Glick, 1994). Most of these typologies are not explicit about how the first-order or second-order constructs are related to the ideal types, or they have not been subjected to empirical testing and validations. Nevertheless, the typology of projects developed by Shenhar and Dvir (1996) represents a good example that confirms to the full definition of a typology.

For the sake of illustration and to become familiar with what a typology might actualize in a project management context, we will briefly discuss how Shenhar and Dvir’s two-dimensional project typology was developed and tested. This example was
chosen based on its relative simplicity and smaller number of dimensions. Initially, based on their own prior theoretical research (Dvir and Shenhar, 1992; Shenhar, 1993), Shenhar and Dvir selected the dimensions of “system scope” and “technological uncertainty” as first-order constructs. Thus, each project is classified based on these two dimensions. Later on, Shenhar and Dvir expanded their original typology to include four dimensions: “novelty”, “technology”, “complexity”, and “pace” (Shenhar and Dvir, 2007). However, for ease of demonstration, we will explain their two-dimensional typology.

In the next step, some points along each typological dimension were identified as the ideal types. Within the technological uncertainty dimension, four ideal types (levels) were specified: low-tech project, medium-tech project, high-tech project and super high-tech project. Within the system scope dimension, the typology included three ideal types: assembly projects, system projects and array projects (programs).

After identifying the ideal types, Shenhar and Dvir selected some management tools and practices as second-order constructs to describe the characteristics of each ideal type. Initially, the description of the ideal types was based on the authors’ prior theoretical insights and was not constrained by the existence of real projects or by project samples (Shenhar and Dvir, 1996). It was only later that empirical testing allowed them to confirm or adjust the proposed ideal types by verifying the convergence of management styles as one moves along the two dimensions of typology (from one ideal type to another). For example, the typology initially included five ideal types along the system scope dimension, but later data showed that management styles converge to only the three ideal types of assembly, system and array.

Eventually, based on the differences between the second-order constructs of real projects and those of ideal types, Shenhar and Dvir explained the level of project effectiveness/success as the dependent variable. For example, NASA’s Challenger project in 1986 was a super high-tech project that needed to be managed as such with a flexible leadership style and high tolerance for change. However, in fact, it was only managed as a high-tech project with a more formal and rigid style (Shenhar, 1992). Shenhar and Dvir argue that this discrepancy in the project’s management style (difference between second-order construct of real project and ideal type) was the reason for the project’s failure.

In the next section, we will elaborate on how typologies can contribute toward theory development in project management.

4. Implications

After clarifying the concepts and components of classification and typology, in this section we discuss the implications of these two concepts for further theory development in project management. Fig. 3 summarizes the theoretical implications of classification and typology in project management.

In a nutshell, we argue that, by using a theory for classification, a researcher can select some significant features (in light of the underlying theory or theoretical perspective), make homogeneous categories, and delimit project types. These steps are essential, but often forgotten, requirements for the development of middle-range theories. On the other hand, we contend that a well-developed typology, which respects certain conditions, can itself be regarded as comprising a grand theory and multiple middle-range theories. In the next subsections, we will expand on the logic behind each of these statements.

4.1. Implications of classification for theory development in project management

In addressing Söderlund (2011b) call to specify the types of projects and develop more unified theories, we highlight the fact that lack of proper classification is a major reason hindering project management from achieving this goal.

As depicted in Fig. 3, initially, researchers should focus on the fact that the classifier’s underlying theory or theoretical perspective (theories for classification) plays the main role in selecting classification criteria. Each theory for classification sees the subject through its own lens and distinguishes between “significant features” of an entity and trivial ones. Therefore, a researcher who is a proponent of some theory or theoretical perspective (e.g., contingency theorist) can select the significant features of entities from that perspective (e.g., project contingency factors) as the classification criteria and classify projects based on them.

Furthermore, if similar projects, in terms of some specific classification criterion, are put into the same category, a relatively “homogeneous category of projects” is constructed. The more similar features projects have, the more homogeneous each category becomes. We interpret “project type” as a homogeneous category of projects which share a certain degree of similarity in terms of specific features. The reason is that, on one hand, most project management studies refer to ‘project type’ as a group of projects categorized based on similarity in

![Two-dimensional project typology developed by Shenhar and Dvir (1996).](image-url)
some characteristics (see Müller and Turner, 2010; Shenhar, 1992; Shenhar and Dvir, 1996). On the other hand, a group of entities with similar characteristics is generally called homogeneous. Therefore, by making homogeneous categories, we are able to specify and delimit types of projects. For example, if projects are classified based on “uncertainty” and “complexity”, we can expect to construct two major homogeneous categories, one that could be called an “R&D project type”, with relatively high levels of uncertainty and complexity, and the other which could be described as a “construction project type”, with relatively low levels of complexity and uncertainty.

After constructing the relatively homogeneous categories of projects and delimiting a project type, researchers can test hypotheses and build theories related to that project type. Limited-in-scope theories (Merton, 1968), which describe the laws that govern the functions, processes, and behaviour of projects within a single project type, are referred to as middle-range theories (Packendorff, 1995). By developing a variety of middle-range theories, the project management discipline will gain more unified theories which are focused on one project type, as envisioned by Söderlund.

Nevertheless, although researchers are encouraged to move toward the unification of theories by focusing on project types and developing mid-range theories, they should also pay attention to a holistic view of the theories developed in different study areas across all papers. An interesting suggestion in this regard is made in the work of Joslin and Müller (2016), who suggest simultaneously examining each theory from different philosophical perspectives. By doing so, researchers gain a more comprehensive understanding of the different ways in which the problem is seen (ontology) and understood (epistemology), and the different kinds of research methods applicable. Consequently, they should be able to better compare and evaluate the developed theories. As a result, researchers are able to know where their mid-range theory stands in the meta-view of project management theories and see the similarities and differences among various theories. This would create a balance in theory development by disregarding the possible existence of a universal theory and also avoiding isolated theories.

4.2. Potential “theories for classification” in project management

As we explained, using a theory for classification, whatever it may be, is an essential requirement for constructing homogeneous categories, differentiating project types, and developing mid-range theories. However, the majority of studies in the project management literature are not explicit about the underlying theory used as the basis for project classification. That is why most project classification schemes seem to be developed heuristically and without any solid theoretical basis.

Moreover, Crawford et al. (2005) found out that even in the majority of organizations that deal with projects, the logic underlying the development of a project categorization system remains implicit. It is a challenging task to uncover the implicit theory underlying those classification schemes. However, giving these studies the benefit of the doubt, we cannot claim with certainty that there is no underlying theory behind them, as the classification of objects or concepts in any field of science is always done from a theoretical point of view, even if implicit (Hjørland, 2008). Therefore, we will look at the possible theories or theoretical perspectives which may have been used in project classification.

There has been extensive research into the existence of different theoretical schools of thought/perspectives in project management. In a series of editorials in IJPM, Turner launched a discussion intended to culminate in a theory of project management (Turner, 2006a, 2006b, 2006c, 2006d). Slightly later on, in a series of editorials in PMJ, Bredillet with his colleagues Turner and Anbari in a series of editorials in PMJ, take a looked at the whole theoretical perspective of project management research and identified nine schools of thought or perspectives on project management: the optimization school, modelling school, governance school, behaviour school,
success school, decision school, process school, contingency school, and marketing school (Bredillet, 2007a, 2007b, 2007c, 2008a, 2008b, 2008c). Winter and Szczepanek (2009) referred to this multiplicity of project perspectives as “images of projects” in order to make sense of the complex realities of projects. Slightly different, Söderlund (2011a) divided the current state of theorizing within the project management field into seven “schools of thought”: optimization school, factor school, contingency school, behaviour school, governance school, relationship school and decision school.

Among the school of thoughts/perspective in project management, many studies, particularly those adopting the contingency school of thought/perspective, have proposed that project contingency factors are reasonable classification criteria to group similar projects together. The proponents of this view argue that, similar to “organizational contingency theory” (Burns and Stalker, 1961; Lawrence et al., 1967; Waldman, 1965; Woodward, 1958), projects are greatly influenced by the organizational contexts in which they take place (Howell et al., 2010). Therefore, contingencies are significant factors in classifying and differentiating among projects.

Thus far, many contingency factors have been introduced to classify projects, including complexity (Davies and Mackenzie, 2014; Shenhar and Dvir, 2007), uncertainty (Howell et al., 2010; Loch et al., 2008), risk (Bariki et al., 2001; Floricel and Miller, 2001), project institutional environment (Dille and Söderlund, 2011; Scott, 2012), urgency, team empowerment, and criticality (Howell et al., 2010). As an example of how these contingencies may be used in classification, consider a researcher who classifies projects based on “risk” in order to differentiate “risky project types”. In such a classification, the more projects in a category have the same level of “risk”, the more homogeneous the category becomes. By doing this, the researcher can delimit risky project types and develop and test hypotheses and theories about these types of projects.

Although insights from the contingency school of thought/perspective are very valuable for project classification, they are not the only theoretical basis that can be used for classification of projects. Theoretical insights from other schools of thoughts/perspectives can also be used to distinguish between significant and trivial project features, and subsequently devise a classification based on these significant features. For example, a researcher in the decision school of thought would differentiate between “public investment projects” and other types (Söderlund, 2011b) by using completely different criteria for classification such as “source of funding”. The reason is that “source of funding” is regarded as “significant” for project management from the point of view of decision theory. So a classifier who sees the project world through the lens of that theory or school of thought would be more inclined to use that particular feature to classify and differentiate among projects. As the result, we can see that, for the same samples of projects, each theory or school of thought can potentially create a different classification scheme.

We should note that each project category is only perceived as “homogeneous” in the particular theoretical school of thought applied. The projects grouped together as homogeneous in a particular school of thought may be perceived as quite heterogeneous and unrelated in the view of another school of thought because the “significant” features in each theory for classification are different and dependent on the particular purpose of that theoretical view. Simply put, homogeneity (of categories) is in the eye of beholder. Part of the reason for this phenomenon is the ambiguity of defining a project itself and the fact that each classifier sees the project world from his/her own theoretical point of view which may focus on different aspects of a project as significant features. That is why no particular theory for the classification of projects is any better than the others when it comes to making homogeneous categories.

Alternatively, instead of using project management schools of thought/perspectives for classification, researchers could adopt management and economic theories to classify projects into homogeneous categories. Still, the selected theories should make sense in the project management context. While it is by no means an exhaustive list, Table 1 shows some examples of studies that adopted management and economic theories in the project management context.

As Table 1 shows, some researchers have applied management and economic theories in the project management context and thereby identified some significant aspects of project management. Each of these significant aspects can be further used as a project classification criterion. In this way, future researchers can make homogeneous categories of projects (in light of the applied theory) and are enabled to further develop middle-range theories about the constructed categories.

4.3. Implications of typology for theory development in project management

Not only is typology different from classification by definition, but its important role as the starting point for developing a theory (Shenhar and Dvir, 1996) is far more undervalued in the project management literature. We believe that lack of enough typology in project management represents a missed opportunity that contributes to the underdevelopment of theories in this field. To address this issue, we will explain in this section how a typology itself is a unique kind of theory and elaborate on the implications it may have for future theory development in project management.

4.4. Typology as a unique kind of theory

A theory is traditionally defined as a series of logical arguments that specify the relationships among constructs, concepts, or variables (Bacharach, 1989; Blalock, 1969; Dubin, 1969; Whetten, 1989). However, not all theories conform to this traditional definition. Doty and Glick (1994) argue that a properly developed typology can itself be considered as a unique form of theory, even if it is not expressed in the traditional manner. Fiss (2011) also contends that typologies are unique kinds of theories because, instead of just simple correlations between a single construct and a dependent variable, they incorporate asymmetric causal relations in their configurational arguments which explain how ideal types are made. Because typologies account for multiple causal relationships among constructs by simplifying them into a few easy-to-remember ideal types (McPhee and Poole, 2001), they
reduce complexity to manageable levels, both conceptually and methodologically (Fiss, 2011).

Moreover, in a typology, variation of the dependent variable is not explained by a single attribute but instead by the relationships and complementarities between multiple characteristics (Delbridge and Fiss, 2013). This multidimensional nature of typologies, along with the configurational arguments embedded in the ideal types, makes it possible to capture the complex and interdependent nature of organizations (Fiss, 2011). Such advantages make the typologies theoretically attractive (Delbridge and Fiss, 2013) and have induced many theorists to use typology to understand the complex examples of a phenomenon (Biggart and Delbridge, 2004).

Devising a typology is particularly valuable in the early stages of a scientific discipline’s development, because the initial foundations for theory development are generally established through a systematic ordering of the main elements of a complex phenomenon (Snow and Ketchen, 2014). That is why the typological approach to theory development has attracted considerable attention in management and organizational science as a promising avenue for theory development (Delbridge and Fiss, 2013). As a result, some of the most important contributions in management and organizational literature are typologies — for instance, those of Miles and Snow (1978), Mintzberg (1979) and Porter (1980).

In general, theory development has three main purposes: description, explanation, and prediction (Kerlinger and Lee, 1964). Basically, typologies are very useful for both description and prediction (Snow and Ketchen, 2014). Doty and Glick (1994), however, argue that typologies meet at least three key criteria that all theories must have:

1. The constructs are identified.
2. The relationships among these constructs are specified.
3. These relationships must be falsifiable subject to empirical examination.

A well-developed typology respects the first condition because it is well informed by the theory from which it draws the distinctions, relationships and synthesis of conceptual importance (Burns and Stalker, 1961; Miller, 1996). Typologies also respect the second condition because the relationships among the second-order constructs used to describe each ideal type are hypothesised and discussed coherently so they will have normative implications (Miles and Snow, 1978; Mintzberg, 1979). That is why the precise description of relationships and interdependencies among the constructs within ideal types has been the essence of organizational configuration (Miller, 1990). Typologies also respect the third condition because all the configuration arguments and predictions about the dependent variable should be stated clearly and in a testable way. All well-developed typologies have always been subject to empirical investigation and many of them have been confirmed, revised or discarded (Doty and Glick, 1994).

Typology as a theory is more complex than traditional theories because it has the capacity to capture the various causal relationships involved instead of interaction between only two variables (Doty and Glick, 1994). That is why Doty and Glick argue that a well-developed typology can be considered as a unique form of theory that includes a grand theory and multiple middle-range theories. A grand theory of a typology predicts a level of dependent variables based on the “fit” between the features of existing entities and the ideal types. In addition, the descriptions of ideal types (by second-order constructs), along with hypotheses about their internal consistency (relations of second order constructs), represent multiple middle-range theories (Pinder and Moore, 1980; Weick, 1974). Because typologies constitute multiple ideal types to allow one to understand a single phenomenon, they require multiple middle-range theories.3 Fig. 3 illustrated how a typology can contribute to development of theories.

Following our earlier example, Shenhar and Dvir (1996) empirically demonstrated that their project typology met all three conditions for qualification as a theory. With full empirical testing based on a sample of 127 projects, they demonstrated that many of their proposed second-order constructs were correlated with the two dimensions of “uncertainty” and “scope”, as they had predicted. For example, they observed an increase in “the number of design cycles” as the level of “technological uncertainty” rose. These kinds of arguments, explaining how second-order factors change as we move through each typological dimension (from one ideal type to another), constitute typological middle-range theories.

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3 There is an important distinction between usual “middle-range theories” and the “middle-range theories in a typology”. Traditional middle-range theories (Merton, 1968) are similar to traditional bivariate theories, which generally explain a whole phenomenon, albeit with narrower scope (e.g., a project type). One the other hand, the “middle-range theories in a typology” are concerned with the internal consistency of the typology’s ideal types and refer to the patterns of second-order constructs in each of the developed ideal types.
Moreover, Shenhar and Dvir’s empirical results confirmed that projects which exhibited notable differences from the characteristics of the proposed ideal types were considerably less successful than projects whose organizational and management characteristics were similar to those of ideal types. These observations allowed the authors to restate their typological grand theory as “the more similar the project style of a project is to that of a proposed ideal type, the more successful/effective it will be”. Accordingly, they argued that any discrepancy between the characteristics of a project and the ideal types would decrease that project’s success/effectiveness (Shenhar and Dvir, 1996, 2007).

Although this description of typology corresponds to Koskela’s expectation that “a theory of project management” should be prescriptive and reveal how action contributes to the goals set for it (Koskela, 2000; Koskela and Howell, 2002a, 2002b), we argue that it is more appropriate to consider the grand theory of Shenhar and Dvir’s typology as a “theory of project effectiveness”, and not a “theory of projects”. The reason is that a “theory of projects” (Söderlund, 2004), which serves to explain and predict project structure and behaviours, has a broader sense than the “grand theory of a typology” which aims to explain only one specific variable (e.g., project effectiveness/success). The same reasoning holds true for organizational typologies, such as Mintzberg’s typology, which should be considered a “theory of organizational effectiveness” and not a “theory of organizations”, because it explains organizational effectiveness as the dependent variable (Doty and Glick, 1994).

4.5. Future directions for typological theorizing

We are aware that developing a theoretically rigorous and fully specified typology is more challenging than traditional bivariate or interaction theories. Yet we believe that this additional effort will be theoretically valuable, since typological theories are more likely to account for the complex, multivariate nature of many projects and perhaps more likely to lead to ground-breaking contributions to project management theory. We hope that by demystifying the dention and components of typology, we will enable future scholars to move beyond traditional linear theories so they can construct various project typologies and fully develop them into typological theories. Future scholars can take two main directions in typology-driven theorizing (Snow and Ketchen, 2014):

1. Evaluate existing typologies for their current relevance.
2. Identify the subject areas where new typologies be constructed and tested.

The first direction is to evaluate existing typologies in order to determine whether, in today’s project conditions, they should be maintained as is, revised, or discarded. Constant evaluation makes a typology robust and valuable. For example, Miles and Snow (1978) typology has been widely researched and tested (Snow and Ketchen, 2014). The initial step in re-evaluation is to select a new sample of projects and reliably measure the characteristics of that sample. Then arguments about the consistency of proposed ideal types can be verified. The next step is to evaluate their proposed grand typological theory by examining the extent to which the deviation of the new sample’s characteristics from those of the ideal types predicts the dependent variable.

Following our example, Shenhar and Dvir’s typology would constitute a good candidate for re-evaluation because their sample of technical projects only included “military” and “commercial market” projects, which may not be representative of projects in general, or in other parts of the world (Shenhar and Dvir, 1996). In this case, one could test whether in other types of projects (e.g., big data projects), an increase in “project scope” augments “project bureaucracy and documentation” as the authors claimed. It is conceivable that, given today’s high usage of agile methods, particularly in software projects, such arguments should be revised. Other proposed typologies in project management such as Mazouz et al. (2008) typology of PPP projects and Kujala et al. (2010) typology of solution-specific business models in project-based firms are also potential candidates to be re-evaluated. This would help future researchers to supplement earlier theoretical findings.

The second direction for typological theorizing is to identify promising subject areas for developing a new typology. Although many project classification schemes, such as those of Evaristo and van Fenema (1999) and Blismas et al. (2004), have not been developed into full typologies, their proposed classification schemes can be used as the basis for further development of various typologies. Moreover, future researchers can investigate a variety of other project management dimensions in order to propose new typologies. These dimensions can be any important aspects of projects used by prior researchers in their classification schemes. For example, some other project dimensions that could be used as the basis for a typology are industry, size, customer, contractor’s organization, political, financial, geographical situation and so forth (Shenhar and Dvir, 1996).

Going further, it is not necessary to limit our attention only to developing typologies of “projects” as the phenomenon under study; typologies are also needed in emerging topic areas (Snow and Ketchen, 2014). Some emerging areas in project management research have great potential for typology development. For example, one such area is the development of a typology of Project Management Offices (PMO). Many authors have argued that a typology of PMOs would greatly facilitate their design, description, analysis and management (Crawford, 2010; Dinsmore, 1999; Englund et al., 2003; Kendall and Rollins, 2003; Light and Berg, 2000). However, many existing PMO typologies have not been empirically validated and present only a limited number of types of PMOs (Hobbs and Aubry, 2008).

In an empirical study that relied on the identification of statistical associations among the characteristics of PMOs and of their organizational context, Hobbs and Aubry (2008) found extreme variability found among PMOs. They concluded that their statistical results and their model could only provide guidance and were not strong enough to form a well-defined typology of PMOs. In a later study, Müller et al. (2013) focused only on the relationships that PMOs had with their “stakeholders” to develop a typology. They called for more quantitative studies...
with a larger sample of PMOs to prove and stabilize their typological model.

In summary, we argue that, in addition to the re-evaluation of current typologies, there are still many other interesting directions for future project management scholars to develop a typology and contribute to theory development in this field.

5. Conclusion

This paper addresses Söderlund’s (2011b) call to develop more unified theories which are focused on one “project type”, regardless of the theoretical schools of thought/perspectives applied, the problems concerned or the different phases of the project life cycle. We highlighted the role of classification as the fundamental, but often forgotten, step in this process. We argue that, by using theories for classification, researchers are enabled to delimit project types and develop middle-range theories. In this way, project management scholars can generate additive knowledge for theories that are more unified, vigorous and reliable, albeit narrower in scope.

Moreover, in our review of the literature, we noticed that a consistent research vocabulary for project classification has yet to be established. In particular, semantic confusion exists between two important terms: classification and typology. That is why we tried to construct a common lexicon – definitions, components and theoretical implications – for these two terms, in an attempt to alleviate this confusion that reigns in the project management research community. This could help project management researchers grasp the differences between these concepts and hopefully use them more appropriately and more consistently in future studies.

We also pointed out that lack of typologies represents a missed opportunity in the development of theories in project management. We argued that, although developing a fully specified typology is more challenging than developing traditional bivariate theories, it will be worthwhile, since typological theories are more likely to account for the complex, multivariate nature of many projects. We also explored two promising directions that future project management scholars can take to engage in further typology-driven theorizing. First, they can evaluate existing typologies for their current relevance; second, they can work on subject areas where new typologies can be constructed and tested. This would constitute a major strength of this paper as it takes an important step, helping the project management community to catch up with the current state of theorizing in other fields such as management and organizational configuration. The main limitation of this study is that it does not consider project classification from the cognitive science perspective, in which categories are cognitive concepts with a dense center, called the “prototype”, and fuzzy overlaps (Rosch, 1975, 1978). Therefore, there is an embedded risk of category overlaps, particularly when we use the project types as the reference point of theory development. It would be worthwhile for future researchers to delve into cognitive psychology in order to examine whether prototypes of project categories (i.e., the summary representation or most typical project in a category) can be set as reference points for delimiting widely accepted project types among different researchers or practitioners.

We hope that this paper stirs up the project management community’s interest in classification and typology research, which has been long neglected. Because we are still in the early stages of theory development in project management (Söderlund, 2011b; Yung, 2015), researchers who devise various middle-range theories or typologies can make major advances that could lead to ground-breaking contributions. These contributions also give managers a richer set of theoretical tools, making them better able to solve the problem they are currently facing (Anderson, 2007). After all, “there is nothing more practical than a good theory” (Lewin, 1951, p. 169).

Conflict of interest

There is no conflict of interest.

References
