

# The ‘Right’ Knowledge and Spin-off Processes: an Empirical Analysis on Knowledge Transfer

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**Abstract** Recent advances on cognitive theory shift from a trade-off between individual and collective knowledge to attempt a closer look at the re-conceptualization of knowledge production and exploitation activities. Findings from the study of human cognition indicate that people have limited information-processing capacities and consequently adopt organizational rules in overcoming individual cognitive limitations. Researchers therefore rely on mental scripts and heuristics to make sense of the knowledge use in organizations. This study extends the previous line of research by seeking to uncover the specific ways in which individuals process information and share knowledge to link organizational learning and entrepreneurial action. Specifically, our focus has been maintained on the most problematic issue about knowledge transfer dynamics: spin-off is viewed as exploiting knowledge their founders learned in prior employment and moved outward to new business initiatives. The spirit that motivated this research was twofold: firstly, previous literature recognition provided critical insights for the development of the model. Secondly, on-field verification sought to confirm the hypotheses on the suitability of spin-offs to serve as a vector for the transfer of the cognitive map developed in parent firms.

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## Introduction

The essay on knowledge transfer and reproduction is part of the recent scientific debate focused on the creation and dissemination of knowledge within firms and between different organizations (Spender 1996; Easterby-Smith and Lyles 2003; Kanawattanachai and Yoo 2007; Lewis 2004; Green et al. 2009; Del Giudice et al. 2011). It stems from the economic assumption that knowledge is a scarce resource whose refinement and reproduction creates wealth (Hayes-Roth et al. 1983). ‘It could be argued whether knowledge is scarce, particularly as it can be created, reproduced and shared with as much chance of multiplying value as depleting it’ (Earl 1996, p. 36).

Above all, for the firms, learning about, dealing with and transferring knowledge represent valuable organizational mechanisms for enhancing the basis for efficient resource exploitation. We argue that the way in which knowledge is structured in the process of extension of formal rules into the minds of individuals holds important implications for the organization's ability to acquire knowledge for producing value and the individual's ability to capitalize on this knowledge by starting new ventures. Moreover, the mere possession of knowledge does not ensure that the firm obtains the benefits that can result if it is properly exploited (Carayannis and Wang 2012; Del Giudice and Straub 2011). It is necessarily a kind of relationship between intentional development activities and the emergence of knowledge exploitation. Such intentionality is based precisely on the interaction of people who have the knowledge and are able to create new knowledge (Nonaka and Konno 1998). It seems clear, therefore, as the angle of observation of this work is twofold:

- (a) From the point of view of the company, which will have the ‘right’ knowledge in order to compete more effectively in turbulent markets
- (b) From the point of view of the individual, who can process the ‘right’ knowledge in order to better perform tasks and get even changing from employee to entrepreneur

The primary research objective of this work is to investigate cognitive development of the entrepreneurial formula (of one firm) to ways to excellence ‘reusable’ in new ventures ex post by the individuals who are able to encode (knowledge re-use).

The firm, therefore, appears in this work as the environment of choice for sharing ‘right’ knowledge and elaborating scripts (Schank and Abelson 1977; Abelson 1981; Gioia and Poole 1984; Edwards 1994a, b). The concept of ‘critical’ script for success can be more easily understood when analysed in the light of the theories of business cognitive maps (Huff 1990). Knowledge mapping consists in the census and representation of knowledge available throughout the enterprise or in its specific areas, and in the recognition of those individuals who possess that specific knowledge. It is straightforward to understand how maps are instrumental in the process of strategic analysis: the firm identifies the critical skills, expressed in the form of individual or group knowledge, and assesses its strategic implications and its co-participation in the achievement of the corporate objectives. In this respect, individuals with specific ‘critical’ knowledge would synthesize, through the repetition of actions, a script that, being ‘critical’, takes part in the company's success. One of the goals of this research

is precisely the verification of the ability of these individuals to turn from employees into entrepreneurs, just because they possess the ‘critical’ script of encoded knowledge.

In this perspective, spin-offs have been assumed as a valuable tool to overcome barriers to contextualization (Nelson and Winter 1982) and communicability (Nonaka and Takeuchi 1995) that were considered to inhibit the reproduction of the genetic map of the success. The empirical analysis on the transfer of knowledge in the spin-off process confirms the hypotheses developed on the transferability of cognitive models in new businesses.

New firms build their genetic moment and much of the competitive advantage on a strong cognitive matrix; therefore, the firm that wants to dominate the market instability and flaunt a winning formula management should adopt the ‘right’ knowledge since birth (Del Giudice and Della Peruta 2011; Corley and Gioia 2004).

The main contribution to the management literature that we believe has been made through this empirical study arises from a threefold consideration: the cognitive map (1) emerges from the ‘primordial soup’ of business knowledge and can be ‘encoded’ by individuals in a set of cognitive scripts; (2) it can be externally transferred (through spin-off processes); (3) it may trigger the reproduction of a successful business formula.

## Theoretical Background

Knowledge that can be considered truly ‘right’ in order to create a new business is highly tacit and unexpressed (Nightingale 2003; Ancori et al. 2000). The concept of ‘tacit’, borrowed from Polanyi’s research (1967), also includes what has been referred to as ‘mental models,’ which are all those cognitive structures that more or less consciously guide our actions and decisions. Thus, the ‘right’ knowledge cannot be regarded as detached or fully autonomous from the organization (in the broadest sense) to which it belongs or from the individuals who hold it. The ‘right’ knowledge is a perfect complement to their own well-defined mental models. Moreover, from a substantial point of view, it can be ideally imagined as being formed, in its turn, by three different types of knowledge:

1. Knowledge of a technique, *techné* in Greek or *know-how* in English, that corresponds to a manual skill, which is not captured in a scientific and theoretical manner, but only through extensive experience and several failed attempts (*trial and error* method)
2. Knowledge of individuals that facilitate the exchange of information allows us to compare their ideas and ‘customize’ our knowledge, drawing on their relational capital and cultural awareness
3. The unconscious cognitive side of man, the mental schemas and behavioural patterns acquired over time, our personal *weltanschauung*, expectations for the future, beliefs and perceptions that influence our actions although we are not immediately aware of them, or very often just not in an explicit and codified linguistic manner

The *places* where this ‘right’ knowledge emerges and takes shape can be easily identified, in other words, within the process of knowledge sharing and its conversion from tacit to explicit (the so-called *externalization*, as Nonaka would say). This process is still the most unusual aspect of the whole theory of organizational knowledge, since it has been usually overlooked in other scientific treatises on business ‘intangibles’. In the

externalization, it becomes important that individuals who are to acquire and synthesize knowledge that can be right in order to create an autonomous firm should follow a meta-disciplinary and abstractive approach. It is easy to realize how knowledge defined *right* for an enterprise system (or rather, for its success) can also be *created*, and not just *processed*. If it were only processed, we would have to assume that in nature there is an univocally ‘right’ knowledge that applies to every business and always ensures success no matter what: of course, this determinism is not found in the enterprise system. It is conceivable, at least, that this occurs with reference to *information* only, i.e. a kind of abstract knowledge which is detached from its context of use, and can be easily handled by a machine, but is scarcely efficient without a person who skillfully inserts it in a context and gives it a ‘direction’ of use.

Thus, the assumption that cognitive scripts may emerge from organizations leading to successful entrepreneurship automatically implies that, in those organizations, there must also be individuals who actually know how to codify the right knowledge and benefit from it.

The scripts are made up of some key actions common to all the individuals involved (Abelson 1981). Moreover, at the individual level, the sequence of actions that characterizes the script is likely to vary from one individual to another (Abelson 1981). One of the objectives of this research was precisely to investigate the ability of a typically ‘simple’ script (a management process, often tacitly carried out) to generate a ‘complex’ script (the ability of an employee to re-use the knowledge, even tacit, he acquired to start up an autonomous enterprise).

In more generalized terms, it follows that an organization will be more capable than others to develop potential business models, if it is characterized by:

- (a) Strong interaction and relational skills among the individuals who compose it (in order to develop ideal knowledge to launch a start-up)
- (b) The ability of these individuals to abstract knowledge emerging from their mutual interactions, through its synthesis and codification
- (c) The ability and skill of the holders of such knowledge to transform it, using Aristotle’s terminology, from ‘potency’ to ‘action’.

Thus, the functioning of an organization can be broken down into a cognitive map (*underlying cognitive map*) (Axelroad 1976; Eden 1992a, b), the elements of which represent the dynamic translation of individual or group *cognitive scripts*. Hence, there is a system of sequences of events or behaviours related to specific and well-defined organizational contexts that can be represented. Therefore, *firm-specific scripts*, i.e. those related to the core activities of an organization, can be identified as *critical knowledge scripts* that are important links in the *knowledge chain* of the organization itself.

Therefore, the proposed mode, relying on the importance of knowledge accumulated by an individual, allows us to assert that the spin-off processes can be a vehicle for the transfer of tacit knowledge. This is the heritage of the genetic code of learning organizations, encoded in complex cognitive maps and procedural scripts strongly linked to the context in which they are generated. The ‘migration’ of human resources, in which this knowledge is encoded, from the original organization (parent firm) to the spin-off company, causes the transfer of that knowledge. Moreover, in the presence of a sequential link between knowledge and innovation (knowledge drives the need for innovation, and while fulfilling it, the latter creates new knowledge),

spin-offs appear to be an excellent tool for the transfer of innovation to new business realities (Parhankangas and Arenius 2003; Klepper 2001; Klepper and Sleeper 2002). In fact, the ability of an individual to innovate, and his will to act, encourage him to test in a new reality the set of actions and reactions crystallized in the scripts he masters.

## The Research Design

The starting point of this study is, of course, *organizational knowledge*: organizational knowledge involves sharing and continuous mobilization of all knowledge (including that used in simple tasks). In this way, it gives rise to a melting pot of people and ideas that provides *innovative* solutions to problems in an environment in which the search for possible improvements is commonplace.<sup>1</sup>

In an attempt to understand and ascertain the nature of this knowledge, our research has been arranged in order to proceed step by step.

The first question was whether to identify business contexts characterized by conditions such as the diffusion of entrepreneurship and knowledge transfer. In particular, for the purposes of this study, the analysis will be focused on the latter condition. In the present research, an ambitious goal was set, to investigate the most innovative ways to promote entrepreneurship, verifying the existence of a ‘cognitive map’ at the base of organizations, which synthesizes the genetic heritage of the entrepreneurial success.

Following the indication that in small and medium enterprises (SMEs) entrepreneurs and their closest associates are often invested with a complex set of knowledge and interpersonal relationships which are not formalized, but are intangible, and upon which the success of a business relies, it was natural to research within organizations promoting spin-offs (companies or universities/research centres) informal procedures, which are highly iterative, and tacitly accepted and codified by individuals, and could lead the individual himself to propagate entrepreneurship by spinning off. Thus, the objective was to achieve the theorization, and the resulting empirical verification, of a model of business creation that passes through the transfer of critical success scripts, tacitly held by the individuals of an organization.

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<sup>1</sup> In this regard, Japanese literature has provided a *metaphor* that may be kept in mind throughout this analysis. The Japanese organization is in fact compared to the process that takes place in the game of *rugby*: in the attack phase, the ball moves between the players as they go ahead, with no predetermined exchange pattern, but only in a general line of action that changes and is altered in the game itself (in contrast to what may occur, for example, in a sport such as *relay*, where rules leave much less space for individual initiative, and the baton is passed from one person to another without the possibility of changes). Thus, in the analogy, the ball represents the *ideals*, *values* and *knowledge* of the members of an organization, while the continuous exchange of the ball during the game stands for their continuous *sharing*, that is the common awareness of the *goals* of the organization, its *talents* and its *possibilities*. And all these are done in a natural way, using a method of *trial and error* that reflects the characteristics of the members of the group and, more generally, of human experience (see Nonaka and Takeuchi 1995, Preface, p. viii). The *right* knowledge, as it can be easily understood, does not exist ‘in nature’ already at a finished stage: it generates and refines its essence through the interaction of the people who come in contact with it and decide to use it. The process is intimately tacit and strongly connected to the relational predisposition of individuals and their ability to internalize.

## Research Methodology and Sampling Phase

The identification of the target audience was one of the nodal stages of the research. In order to achieve an effective categorization of the spin-off processes, both academic and corporate related, we primarily proceeded as follows:

- (a) Identification of geographic regions, characterized by a high degree of diffusion of scientific and technological progress
- (b) Selection, within these regions, of geographical areas considered of scientific ‘excellence’, being distinguished by relevant homogeneous identification features (excellence was assessed in a qualitative and quantitative way through exploratory analysis, using as guidelines scientific production statistics submitted by official sources, the average annual number of scientific publications, the average annual number of patents and the perceived importance of the reference area on the web and in the related scientific literature [*citation index*]).

From this initial screening process, three ‘macro-regions’ of excellence appeared of some interest: Europe, the USA and Canada. At this point of the research, an additional selection phase was necessary in order to identify, in each ‘macro-region’ of reference, the learning organizations involved at the same time in processes of knowledge/technology transfer and spin-offs that could be considered representative of a cluster. After having identified a mixed sample of 700 organizations, the empirical analysis was split into two phases: the first devoted to processes of knowledge transfer from academic institutions and research centres (academic spin-offs) and the second focused on corporate spin-off processes.<sup>2</sup>

The formulation and testing of the developed hypotheses benefited from the decisive contribution of multivariate statistical analysis, allowing to reach rigorous methodological conclusions.

## The Empirical Analysis

### *The Construction of the Measuring Instrument*

Subsequently to the sampling phase, standard procedures for the definition of the items and, accordingly, for the identification of the scales were developed following the guidelines suggested by Churchill (1979) and Gerbing and Anderson (1988). The

<sup>2</sup> The empirical analysis of the academic spin-off processes required, in particular, further simplification and selection, which was necessary to standardize the data. The result of this standardization was a database of 100 possible contacts to be more thoroughly analysed through the administration of a questionnaire addressed to the managers of the *Liaison Offices* and the offices for technology transfer, and to the researchers/teachers who took part in the academic spin-off processes. All units in the identified sample proved to have the following identifying features in common:

- (a) A history of documented cases of academic spin-offs
- (b) The certainty of representing and including, according to the researchers of the institution and the scientific literature, interesting cases of academic spin-off processes
- (c) Evidence of a transfer process of a cognitive script underlying the spin-off process

definition of the observed variables used at the same time different techniques, such as in-depth interviews with entrepreneurs and business managers, and bibliographic recognition (Glaser and Strauss 1967; Eisenhardt 1989).

At this stage, therefore, the surveying work consisted in performing a series of in-depth interviews to top managers of 30 Italian learning organizations operating in the IT and TLC fields (5 in the role of parents and 25 in the role of spin-offs).

When this ‘convenience’ sample was established, the following rules were taken into account (Bardin 1977)<sup>3</sup>:

- (a) The rule of representativeness, which consists in ensuring that the corpus is representative of the different perceptions of the respondents
- (b) The rule of exhaustiveness, which consists in taking into account all the elements that are part of the corpus
- (c) The rule of homogeneity of the documents submitted to verification analysis

Preference for the in-depth interview technique, which is widely used in economics and business management research (Evrard et al. 1993), is justified by the fact that it allows respondents to freely express their opinions within a group of topics defined by the researcher (Bailey 1994).

The basic themes used at that stage of identification of possible items were:

- The process of knowledge accumulation
- The description of *cross-fertilization* processes in a learning organization
- The perception of knowledge of a critical script by an employee, potential entrepreneur
- Perceptions related to the possible creation of a spin-off starting from the knowledge acquired

The collected interviews were subjected to an initial series of ‘floating’ readings, characterized by the absence of assumptions regarding the presence of specific elements contained therein and the attempt to obtain a first general overview of the topic.

The in-depth interviews conducted enabled the generation of an initial group of items related to various constructs, which are of interest for the construction of the measuring instrument and whose ‘signalling ability’ was subsequently confirmed by the latent variables that emerged during the factor analysis: ‘script acquisition’, ‘spin-off prodromes’ and ‘reproduction of the cognitive map’.

In particular, this phase revealed a common element to all respondents: the emergence of a spin-off script is naturally connected to knowledge, even tacit, by an employee, of critical processes latent to the success of the parent organization.

Before proceeding with exploratory factor analysis, aimed at determining the latent variables of the model, total correlation of the items obtained and a careful review of Cronbach's alpha were performed. The initial items were therefore redefined, and those deemed non-significant were eliminated. Finally, within the operationalization process of the variables, one of the critical choices concerned the number of points of the measurement scale.

<sup>3</sup> These assumptions were also followed in the selection of the sample for the exploratory factor analysis and the subsequent confirmatory model.

In this regard, there is no univocal consensus in literature on the ideal number of points to be used; the choice often depends on the research objectives and the desirable level of accuracy. In this study, since the primary objective was accurate information, but it was also necessary to focus on the need for flexible responses, it was decided to adopt 3–5-point semantic differential scales (in literature, these scales are considered easy to understand and use, ‘universal’ and with a satisfactory face validity degree (Bagozzi 1994a, b).

The final result was a threefold online questionnaire, divided into several sections<sup>4</sup>:

- (a) A first questionnaire on the spin-off processes examined in the company perspective (corporate spin-offs), organized in 43 items. The questionnaire was addressed to both the mother company and the daughters, but with a filter question (placed immediately after the master data collection section) that automatically addressed the respondent to a series of items intended for the mother company or the daughter.
- (b) A second questionnaire on the academic and research spin-off processes examined in the parent organization perspective (academic spin-offs, parent organization), organized in 41 items.
- (c) A third questionnaire on the academic and research spin-off processes examined in the spin-off perspective (academic spin-offs, daughter companies), organized in 41 items.

The representatives of the population of organizations identified during the sampling phase were invited to respond to the questionnaire by e-mail. The average response rate was generally satisfactory (average answering rate=61.25 %), showing willingness of the surveyed individuals to spontaneously contribute to the research.

Thus, the research design, developed in two subsequent phases, can be summarized as follows:

1. *Exploratory analysis*→definition of scales/items, analysis of observed and latent variables<sup>5</sup>
2. *Confirmatory model*→hypothesis testing and measurement of the identified constructs<sup>6</sup>

### *Exploratory Factor Analysis*

The first step of the analysis process of the script of the potential entrepreneur, and his relationship with the sedimentation of knowledge derived from the parent organization, led to an exploratory study (factor analysis). In terms of research methodology, this choice is justified by the need to reach a description of the concept of knowledge of a spin-off

<sup>4</sup> The data acquisition system is based on an ASP database that can be directly filled out on the website [www.maggioni.org](http://www.maggioni.org).

<sup>5</sup> In this study, we only refer to a few dimensions of the model deemed significant. Therefore, we omit the description of the selection of all the possible derived scales/items, which are object of other publications. The empirical analysis returned a statistically significant amount of data, concerning, however, different aspects of the research, that would have been unnecessary to include in this analysis. For the sake of simplicity, in this study, only variables closely related to the hypotheses to be tested will be reported.

<sup>6</sup> To avoid using the same sample in the exploratory analysis and the confirmatory model, the sample was ideally split into two data sets: a) an exploratory data set of 250 units, on which the exploratory factor analysis was conducted; b) a confirmatory data set of 170 units (only the firms *born* from spin-off processes were considered), on which the confirmatory model was developed.



script, and the main consequences inherent in the possession of a critical knowledge script by an employee who has in mind to ‘turn’ into a potential entrepreneur, exploiting the wealth of knowledge gained in his years of employment with the parent organization.

The exploratory phase required the construction of a *corpus* of data from which to extract information relevant to the investigated issue, in view of subsequent measurement. The first part of the exploratory analysis allowed, therefore, to draw some preliminary conclusions regarding the emergence of a script in the employee that persuaded him to begin a spin-off process.<sup>7</sup> This led to hypothesize a research design and its reference variables:

- (a) The entrepreneurial script is expressed through knowledge of the ‘critical business’ processes (i.e. all those processes, often tacitly activated by individuals, latent to functions that are vital to the enterprise system).
- (b) Possession of the script spontaneously leads the employee to a physiological propensity to change (actually the process goes through a number of ‘mediation’ variables).

Below, the main research hypotheses underlying the model described so far are formalized and explained:

- H1 *Exposure to ‘critical’ scripts leads the employee to a spontaneous process of acquisition of the cognitive map and a natural propensity to spin-off.*
- H2 *Knowledge sedimentation in the employee leads to a spontaneous process of reproduction of the cognitive scripts acquired (through transfer of behavioural scripts).*

The hypotheses were tested with the support of multivariate statistical analysis techniques (in the reported analyses, both SPSS software version 11.0 and LISREL 8.0 were used). The exploratory factor analysis returned three interesting latent variables, and the analysis of Cronbach’s alpha revealed an overall satisfactory levels of consistency (also confirmed by the high ‘internal’ values of the selected items—see Table 1). In fact, the estimate of the consistency of all the scales selected on completion of the exploratory factor analysis complied with a cut-off point loading >0.70 (Nunnally and Bernstein 1994).

### *The Confirmatory Model: Hypothesis Testing and Discussion of Empirical Evidence*

The exploratory factor analysis allowed to highlight the relationships between the observed variables and the latent variables required for the development of the model based on a script that leads to a spin-off (hence, a script of ‘right’ knowledge). The second part of our empirical analysis, instead, consists of a more detailed study of derived latent variables, in order to allow the testing of the formulated hypotheses.

The development of the confirmatory model ( $\phi$  test), necessary to test hypotheses H1 and H2, was performed on the confirmatory data set currently available ( $n=170$ ). These choices are perfectly consistent with the indications of the management literature on the subject (Gerbing and Anderson 1988).

<sup>7</sup> This process is even more interesting, if we focus on the role of the company, which is often unconscious, that facilitates knowledge sedimentation in employees and promotes internal transfer, aiming at a higher sub-systemic resonance (Maggioni and Del Giudice 2006).

In the definition of the model, the fit ratios showed more than satisfactory values, suggesting not to alter the structure of the latent variables selected.<sup>8</sup>

Composite reliability, a measure generated by LISREL similar to Cronbach's alpha, confirmed the good inherent strength of each identified dimension of the model returning generally high values (see Table 2). Finally, the variance extracted for each dimension was generally higher than 0.60, revealing high sharing between the indicators of each dimension (Fornell and Lacker 1981).<sup>9</sup>

The model developed is structured in two phases: the first—H1—in which the employee who gained critical knowledge contained in a script, including its importance, begins to reflect on the possibility of becoming an entrepreneur, and the second—H2—in which the potential entrepreneur attempts to transfer to his spin-off company the script-based intangibles learned in the mother company. Knowledge to be transferred will make up the cognitive map of the newborn company (and more precisely, it will co-participate in the reproduction processes that the promoter of the spin-off deems vital for the success of the new venture in which he plays the leading role).

Hypothesis H1 focuses, therefore, on the possibility that an individual, accumulating a set of knowledge that he considers essential, can imagine to use it again, even on the borderline of opportunism, in his own business venture. The accumulation of knowledge essentially derives from the fact that the individual 'synthesized' it by seamlessly activating a series of cognitive scripts. If these scripts are essential for the performance of certain 'critical' management processes, there will be a very high probability that they may be opportunistically reused in a new company.

In fact, the circulation of vital knowledge in the operational structure of the enterprise system is often required by the governing body itself in pursuing the objective of increasing business resonance and supporting development and innovation. This implies a necessary increase in the transfer of tacit and explicit knowledge among the individuals who are members of the operating structure and a consequent greater coordination of these flows by the top management.

The criticality of the model is mainly perceived in SMEs, where individuals are physiologically more often in contact with processes that are critical to support the company's competitive advantage. Therefore, on the one hand, it will be easier for them to manage these processes by developing behavioural scripts that can reduce the cognitive effort inherent in the activation of the vital process to which they are devoted, and, on the other hand, they will be more likely to learn a 'formula' susceptible to be reproduced in another company.

It is worth pointing out that hypotheses H1 and H2, whilst closely correlating that ability of synthesis of a cognitive script with the latent constructs 'propensity to spin off' and 'reproduction of the cognitive map', of course do not exclude co-participation in the budding process of the classic reasons that lead individuals towards entrepreneurship

<sup>8</sup> Although  $\chi^2$  returned statistically high values ( $\chi^2=42.64$ ,  $df=169$ ,  $P<0.01$ ), the other fit indexes confirmed the total acceptability of the model (Tucker Lewis Index=0.81; comparative fit index=0.95; Bollen 1989).

<sup>9</sup> In this study, for the sake of simplicity, the values of the  $\chi^2$  difference test will be omitted, as they all returned fully satisfactory values.

**Table 1** Exploratory factor analysis

Scales/items	F1	F2	F3
Acquisition of the cognitive script ( $\alpha=0.92$ )			
1. I believe that the use of the acquired know-how is one of the main reasons that lead an individual to spin off	0.91		
2. I believe that confidence in business idea is one of the main reasons that lead an individual to spin off	0.94		
3. I believe that technical know-how and training are important factors that lead an individual to spin off	0.87		
4. I believe that personal contacts (developed while working) are important factors that lead an individual to spin off	0.85		
5. I believe that participating in the development of advanced projects is an important factor that leads an individual to spin off	0.91		
Propensity to spin off ( $\alpha=0.87$ )			
1. I believe that the use of the acquired know-how is one of the main reasons that lead an individual to spin off		0.89	
2. I believe that confidence in business idea is one of the main reasons that lead an individual to spin off		0.90	
3. Some individuals in the organization are more inclined to promote spin-offs than others		0.85	
4. Some functions in the organization are more inclined to promote spin-offs than others		0.87	
5. The spin-off process was spontaneously desired both by the parent organization and the employee		0.91	
Reproduction of the cognitive map ( $\alpha=0.84$ )			
1. The spin-off company is in the same industry as the parent organization			0.83
2. The spin-off company is in the same industry as the parent organization functioning as service provider			0.76
3. There is generally an average degree of continuity and similarity (know-how and types of technologies used) between the parent organization and the spin-off company			0.82
4. I believe that technical know-how and training are important factors that lead an individual to spin off			0.91
5. The promoters of spin-off processes are used to working in 'technical' areas (R&D, Production) [also in the daughter company]			0.89
Eigenvalue	3.47	2.79	5.46
Percent explained variance	9.65	8.15	14.77

(desire for prestige, increased income, greater autonomy, confidence in their own business idea, etc.).<sup>10</sup>

<sup>10</sup> It is noteworthy that whether knowledge sedimentation was induced by the governing body in an attempt to pursue sub-systemic resonance, or the process was unconsciously and spontaneously enabled in the individual (hence, without predetermination by the governing body), the final consequences of the process are relevant: the individual who accumulates knowledge (in the form of cognitive and behavioural scripts), related to critical business processes, will probably tend to use it in a new business venture in which he himself plays the leading role. The assumption that the individual (in this case the employee) accumulated knowledge during his stay at the mother company is inherent in the scale called 'Acquisition of the cognitive script' and in the items that describe it.

**Table 2** Confirmatory model

Dimensions of the model	$\phi$ estimates <sup>a</sup>		
	1	2	3
Acquisition of the cognitive script (1)	1.00		
Propensity to spin off (2)	0.73 (22.5)*	1.00	
Reproduction of the cognitive map (3)	0.89 (19.27)*	0.77 (15.65) <sup>b</sup>	1.00
Standard deviation	1.25	1.54	1.72
Composite reliability	0.86	0.83	0.91
Variance extracted	0.45	0.67	0.52

<sup>a</sup> The first number indicates the value of the phi coefficient. The second is the value of *t*

\* *P*<0.01, significance level

The critical point in the development of the empirical analysis was, therefore, to prove first of all the existence of a possible correlation between the accumulation of knowledge (expression of the acquisition of the cognitive script) and the propensity to spin off (test sub H1), linked to a precise determination of the new entrepreneur to transfer to a daughter company some knowledge deemed ‘critical’ (test sub H2).

The confirmatory model developed (Table 2) clearly shows these close correlations (Acquisition of the cognitive script, propensity to spin off  $\geq \phi=0.73$ ; Acquisition of the cognitive script, reproduction of the cognitive map  $\geq \phi=0.89$ ), demonstrating the ability of the individual who learned certain cognitive scripts to turn from employee to entrepreneur, retracing the ‘footsteps’ of the mother company’s success and supported by his *right* knowledge.

Moreover, it is not difficult to understand how knowledge, after permanent acquisition by an individual, to the extent that it was related to scripts that were ‘critical’ for the preservation of the mother company’s competitive advantage, may, *ceteris paribus*, represent the starting point for the success of the spin-off.

### Final Insights from the Model

The model presented is significantly related to the revaluation of the *tacit* and *personal* aspect of knowledge that is not directly accessible, except by means of a ‘transformation’ by the individual. The continuous exchange which is generated between the inside and the outside of the organization is what keeps alive the ability to innovate of its members; meant as a transition of knowledge from one dimension to another and from one individual to another, from more encoded forms to others that are less accessible, the *flow* is an uninterrupted transformation, a continuous process of knowledge conversion.

Three immediate considerations are possible downstream of the empirical analysis conducted:

- (a) In an enterprise system, but especially in nature, there is no a priori knowledge that can be considered univocally ‘ideal’; there are more and more good insights

and valuable skills which, combined and shared among individuals, can result at times in the ‘rightest’ knowledge to start a business venture.

- (b) Knowledge which can be considered ‘right’ for the purpose of creating business is by nature highly tacit and unexpressed, it is created in an informal way, and it evolves and is customized on a personal and group level. As soon as it condenses in cognitive scripts, it begins to acquire the ‘gift’ of transferability. However, this does not occur following the customary paths of *communication* and *language: action* is required, and also sharing by the individual who is its repository. In this perspective, budding is a valid evolutionary path to re-use knowledge deemed ‘right’ by those who possess it and are willing to become entrepreneurs relying upon it.
- (c) The relational factor is one of the cornerstones in the development of the ‘right’ knowledge: comparison and exchange of information with other individuals, mostly on an informal basis, interweaving of experience, combined with the personal elaboration of a behavioural script, encourage the development of vital knowledge.

It follows immediately that the lever for innovation is therefore inherent in the possibility of converting experience into information and information into experience, provided that the tacit component of knowledge is recognized and fully appreciated, as it ensues from the opportunity of learning something also with the *body*, and not with the mind alone.<sup>11</sup>

### Limits and Further Research

In conclusion, it is necessary to suggest some limits of this study, and hence some ideas for future research. A first limit may be found in the identification of the only ‘right’ knowledge for the purpose of a business start-up, such as that which is originated within the enterprise system, and leads an individual to re-use it for personal advantage, after it has been suitably encoded, although at a subconscious level. However, this study is not meant to identify knowledge that is univocally ‘right’ to start up a new business: it simply aims at highlighting how from a business, and organizational environment in general, shared models, both tacit and unexpressed, can emerge and evolve. These, when synthesized by individuals in cognitive scripts, can, *ceteris paribus*, lead to the assumption of a possible reproduction *outside of* the cognitive map of the enterprise itself. The focus of inquiry into the creation of a firm by spin-off validates and confirms the plausibility of this hypothesis, explaining the choice, strongly supported, to narrow the field of investigation of the ‘right’ knowledge to business contexts that *already exist*. Further empirical studies may venture into a wider generalization of these results, also considering different industries of reference or examining the validity of knowledge that not necessarily transits through the enterprise. Future research could also try to

<sup>11</sup> This basic assumption is not present (even if it seems so) in two of the most recent developments of business organization: both in Peter Senge’s theory of learning organization, where only the conceptual and mental aspects of learning are enhanced, and in the theorizations for the establishment of a future ‘virtual company’ where, more than anything else, the importance of exploiting knowledge of external partners is emphasized, but the role of external–internal interaction which alone provides the basis for the *creation of knowledge* is neglected (See Nonaka and Takeuchi 1995, pp. 10–11). The third part of this work, to which we refer, is precisely focused on the concept of knowledge acquired and shared through external partners.

understand the *post-entry* evolution of codified knowledge originally believed to be ‘right’. Provided that it facilitates the genetic moment of the spin-off, the way it could evolve has to be questioned together with the best system to manage it in order to ensure the success of the entrepreneurial formula that is reproduced. Finally, future studies could further investigate the post-spin-off attitudes of the individuals involved in the spin-off process: will they be partners or competitors? And what implications, threats or opportunities may arise in both cases for the mother company?

Following our analysis, some brief and more general concluding remarks are required. First, it is plausible to assert that *knowledge management* cannot do without skills that sink their roots into a meta-disciplinary approach (made up of management, philosophy and cognitive psychology). Second, in the analysis of the knowledge it includes, an enterprise must always be regarded as a systemic but inseparable entity, despite basing its essence on the typical dyadic and paradoxical aspects: materiality and immateriality, collective and individual, tacit and explicit, expressed and unexpressed.

Nevertheless, it is difficult to go beyond this cognitive and ontological division which has indeed affected the theoretical foundations of all social sciences, including economics, management science and organizational theory. The history of knowledge management, a field of knowledge closely linked to practice, should, however, be a viable attempt to solve the Cartesian dualism and restore unity between the knower and the known object, moreover, because dualities and oppositions are symptoms of a strongly static and binding way of viewing reality. The drive to mediation, typical of a *unitary* transcendence thought, and the claim that both opposites have the right to survive (whereas the theoretical synthesis would rather betray the *real* world), are all instances that have historically been acknowledged by philosophers and scholars in general. The Aristotelian doctrine of virtue as mediacy, the Hegelian dialectic, and also Voltaire's tolerance, are intended, at least on paper, to maintain the concepts alive and avoid falling back into a static perspective without the conditions leading to development.

This desired flexibility and need for dynamism lead to a final observation: beyond general individual attitude, a necessary but not sufficient condition is that the ‘right’ knowledge to successfully start up a business venture neither seems to spontaneously arise *ex abrupto*, nor is available as an *inventio thesauri*, so it is not purely and simply acquirable from the outside. Instead, it is *built* over time, through dialogue among individuals and relational exchange.

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