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Knowledge dynamics in fragmented industries

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Abstract

In project-based contexts, researchers and practitioners largely explored the trade-off between (i) flexibility and temporality and (ii) knowledge and learning. Flexibility and temporary nature of projects cause both individuals and organisations to adapt and reorganize their existing knowledge while moving from one project to the successive. This becomes particularly critical when economic activities are performed through multi-firm projects and participants change over time. Understanding how learning experiences occurring in inter-firm projects can be capitalized over time is relevant for practitioners and policy makers in order to enhance the competitiveness of firms and industries. Drawing upon evidence collected in the UK media industry, the present paper aims to cast empirical light on these issues, answering the following research question: how knowledge is acquired and retained in multi-firm projects?

Keywords: Project-based Industrie, Knowledge Acquisition and Retention.

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1. Introduzione

Projects are proved to be a highly innovative form of labour division and coordination (Davies and Hobday, 2005). Since the 90s, projects have been studied claiming at the advantage of temporality and flexibility. In fact, they allow firms to adapt to and shape their environment at the same time, by exploring new market and technological opportunities (Brady and Davies, 2004). Flexibility stems from project characteristics, among them temporariness and uniqueness: any project has a temporary nature (Prencipe and Tell, 2001). It involves a constellation of people, often members of different organisations, working together until the project is closed (De Fillippi and Arthur, 1998). These people are “unlikely to join forces frequently, therefore making it difficult to develop persistent organisational structures applied across projects” (Cacciatori, 2004 : 5). Furthermore any project is unique or one-off. It is very likely to have several specific characteristics and require particular activities that are unlikely to be repeated unchanged in successive projects (Davies and Brady, 2000; Hobday, 1998). Finally, even though successive projects can involve similar activities, their long life cycle can cause long time spans between the moment in which an activity is carried out and that in which a similar one is required (Cacciatori, 2004).

One of the issues most debated by researchers and practitioners interested in project based organizations is how to balance the advantage of temporality and flexibility with the inevitable losses of knowledge and learning (Newell et al., 2006; Prencipe and Tell, 2001). In fact, the temporary nature of projects brings disruption and discontinuities in learning and knowledge acquired in previous experience. Such discontinuity affects organizations as well as individuals that are often forced to adapt and reorganize their existing knowledge. Adaptation and reorganisation can create coordination problems and, more important, wastes for individuals in terms of time and experience. Empirical studies so far showed that project-based organisations use several mechanisms in order to retain the knowledge acquired in a particular project and transfer such knowledge to successive ones. Knowledge dynamics have been studied mostly at the level of single PBOs, although in several industries products and services are commonly provided through multi-firm projects. In some cases this brought to the emergence of temporary organisations which come to appearance every time a new project has to be performed (Grabher, 2002; Grabher, 2004; Starkey et al., 2000). These temporary organisations rely on the contribution of several actors, each in charge of specific tasks. From one project to the next, actors may change. Literature showed that in multi-firm projects personal networks play an important role both in the project stuffing and in problem solving activities. However a clear understanding of the dynamics through which knowledge is acquired and retained in such fragmented contexts is still missing. Drawing upon such considerations, the main research question we want to answer is: how knowledge is created and retained in multi-firm projects? Answer to this question will be provided focusing on two sub questions: (a) what are the variables involved in such knowledge dynamics? (b) How those variables relate to each other?

The present paper answers these questions analysing fresh empirical

evidence collected in a specific context: the media industry. The media industry is organized by projects by definition (Grabher, 2002; Starkey et al., 2000; Sydow and Staber, 2002). Project teams in this industry are often made up of professionals operating in different companies (in most cases freelancers). The reason why knowledge issues are more evident in the media industry than elsewhere is because the temporality of projects is more evident than in other contexts. Projects members, once the project finishes, do not continue working in the same company despite of what occurs in other industries. They can work together again in a different project but working ties among players are not formalised. Knowledge created in a project is very difficultly retained and used in the next project. Individuals try to do so but the environmental conditions do not facilitate knowledge retention mechanisms. Another important characteristic that makes this context unique is that individual players have mostly informal relationships. As emerged from the data, contractual issues are not important, especially in relation to mechanisms of knowledge acquisition and retention.

The remaining of the paper is organised as follows: the next section reviews the criticalities identified in literature in terms of knowledge dynamics in fragmented industries. Section three appraises the method and the empirical setting chosen for data collection. Section four provides a description of the variables identified as relevant in knowledge dynamics in fragmented industries, providing a model according to which these variables are involved in knowledge acquisition and retention processes. The final section concludes the work discussing the contribution for practitioners and scholars, limitations and possible further research.

2. Knowledge criticalities in fragmented industries

In several industries economic activities are increasingly performed through multi-firm projects. In some cases, such as legal proceedings and construction sectors, the organisations participating to a given project usually work together also in successive ones and the reciprocal relations are regulated through formal agreements (De Fillippi and Arthur, 1998). In other cases most of the contributors to multi-firm projects are freelancers. The latter are likely to work with different partners from one project to the next and participate to several projects at the same time, covering different roles (Tempest and Starkey, 2004). This occurs in the so called “fragmented” industries (Antcliff et al., 2007 : 372). The latter are characterised by what Starkey et al (2000) and Grabher (2002) call respectively “latent organisations” and “project ecologies”, which appear when a new project has to be performed and disappear when the project ends. The end of the project causes the organisation to disband, and the project participants to “hunt continually for subsequent assignments” as they do not go back to any employing organisation (Grabher and Ibert, 2006 : 7).

The media industry represents an example of fragmented industries. The term media industry refers to newspaper, magazine, book, radio, internet and television. The latter is characterised by organisations that purchase content of different kinds and convert it into a product. The production of the content

itself results particularly interesting for our research aims as organisations operating in the media industry mostly purchase content from independent suppliers.

Independent suppliers provide content produced through projects, the participants to which are recruited on a freelance basis and the production facilities are rented according to the content to produce (De Fillippi and Arthur, 1998; Starkey et al., 2000; Tempest and Starkey, 2004; Windeler and Sydow, 2001). In many cases it requires both the services of creative and business resources (De Fillippi and Arthur, 1998). On the creative side, we can further distinguish between artistic and technical services. Providers of artistic services are actors, directors, script writers, whereas providers of technical services are cameramen, sound experts, light experts, editors. Finally providers of business services are producers, assistant producers, production managers (De Fillippi and Arthur, 1998).

Fragmented industries have attracted scholars attention both in terms of coordination dynamics at the project level and in terms of likely career paths for the members of the industry. As to the coordination dynamics, both Bigley and Roberts (2001) and Bechky (2006) showed that a source of coordination of project activities may be a clear role structure. The latter refers to shared expectations among project participants on the role of an individual holding a given position. As to the career paths, the implications are twofold. Firstly members of fragmented industries undergo a “project-based career” (De Fillippi and Arthur, 1998 : 125), proceeding through discontinuous projects. These project-based careers can vary considerably from one individual to the others (Tempest and Starkey, 2004). The latter have to self-manage their knowledge acquisition and improvement, necessary to perform the various project tasks (Grabher and Ibert, 2006). Moreover they must build a reputation as being good at doing their own work in order to guarantee to themselves future employment (Grabher, 2004). Such reputation flows through “word of mouth judgments” by people who worked together in a particular previous project (Grabher, 2004 : 1504).

Building the reputation of being good at performing their own work is crucial and takes on a particular meaning in fragmented industries. In the latter, project activities have to be undertaken within given time and cost constraints, and have to meet creativity requirements at the same time. Limits of budget and time bring about the need to work with trustworthy people, namely people that are known to be knowledgeable, able to work within given deadlines and to tolerate stress (De Fillippi and Arthur, 1998; Grabher, 2004; Starkey et al., 2000). In some cases, relational skills matter more than technical ones. People prefer to work with people technically less qualified but with good social skills than vice versa (De Fillippi and Arthur, 1998). Who is in charge of stuffing a project team, prefers to work with people he or she worked with before.

In the advertising industry creativity and originality are relevant (Grabher, 2002), as much as they are in the media one. Meeting such needs requires changes of the project team members across projects (Grabher, 2004; Perretti

and Negro, 2007). The newer to the industry the new project team member, the higher the novelty likely to be reached (Perretti and Negro, 2007). Personal networks developed during a particular project, last beyond the end of the project itself. Who is in charge of assembling the project team contacts people they worked with in the past, and ask whether in their “address book” there is someone with the requisites necessary to accomplish the project tasks, both socially and technically (Antcliff et al., 2007 : 380; De Fillippi and Arthur, 1998; Grabher, 2004).

The industry dynamics described so far have some implications in terms of both individual and organisational learning. As to individual learning, pursuing project-based careers has both advantages and disadvantages. Among the advantages, working with different people across projects, causes the individual to learn from a large number of actors within the industry; the probability of covering different roles across projects allows the individual to become multi-skilled (Bechky, 2006); the differences in terms of content, across the contemporary and successive projects he or she takes part to, cause him or her to develop a differentiated experience (Tempest and Starkey, 2004). As to the disadvantages, freelancers are not trained by any employing company; the opportunity of training on the job varies according to the role covered in the project and the most important are covered by people that already have a reputation as being good at covering those roles (Tempest and Starkey, 2004). Furthermore the outcome of learning processes on the job are higher for those who are new to the industry (Perretti and Negro, 2007).

In terms of organisational learning, De Fillippi and Arthut (1998), Lampel et al. (2000), Tempest and Starkey (2004) cast some doubts on the suitability to fragmented industries of the organisational level. In fact, it is difficult to achieve the development of a collectively shared memory where knowledge acquired during a given project is stored and transferred over time and across space. According to Levitt and March (1988), learning occurring at one level can substitute for learning at other levels. As above mentioned, in fragmented industries there is not an organisation which survives to the project experience and sets up learning mechanisms and tools to capitalise on project experiences. However learning occurs both at individual and at collective level. The collective level is alimeted by networks which extend beyond the boundaries of a single project both temporally and spatially, providing the ground for exchange of ideas and solution to problems at a broader level (DeFillippi et al., 2007).

Hence, previous empirical research showed the criticalities of knowledge acquisition and retention characterising fragmented industries. On the one hand it has been showed that personal networks play an important role in assuring the individuals future employment and that most of the knowledge acquisition processes occur on the job, being in contact with more experienced workers. On the other hand, it has been showed that a clear role structure at project level allows the individuals to retain the knowledge acquired in a particular project and transfer it to new ventures, in which they are required to work with new people. However we still know very little about the processes trough which the individuals actually manage to acquire the

knowledge in the first place. Knowledge acquisition processes and factors enabling it at individual level deserve closer attention, given the individualised career paths characterising fragmented industries. This results particularly evident in the media content industry in which project-based careers may impose the individuals to provide interchangeably artistic, technical and business services. The different nature of the service may imply different learning processes and moderators.

3. Method

The empirical context where we carried out data collection is the media content industry in UK; we include in the media content industry all the economic activities related to the ideation and production of motion picture, video, radio and television programmes (NACE codes; 921: Motion picture and video activities and 922: Radio and television activities). Over the past twenty years a process of rapid and radical changes invested the media industry in UK. New technologies increased the number of channels and platforms available to broadcasters, while legislation deregulated the industry introducing competition. The structure of the industry shifted from a vertically integrated structure to a more fragmented one that stimulated the growth of independent production. Further legislation in the 1990s reinforced these industrial structures by imposing quotas on broadcasters, requiring them to purchase 25% of their programming from independent producers (Starkey et al., 2000). Reduced in-house production as a result of independent quotas, together with pressure to cut production costs, resulted in the replacement of permanent, stable jobs with short-term, insecure employment with workers hired on a fixed-term basis for the duration of a project (Antcliff et al., 2005). A research conducted by Skillset in the 2005 shows that the media industry has no stable workforce of its own but borrows from the wider audio visual labour market as and when need arises. The levels of freelancing vary from over half of those working in commercials production (68%) and independent production (57%), to fewer than two out of ten in cable & satellite and the interactive media sectors. Around a quarter of those working in terrestrial TV (26%) and broadcast radio (25%) are freelancers. The research showed also that just under half the industry works in London, and around six out of ten in London and the South East combined. Only over one out of ten are employed in Wales, Scotland and Northern Ireland. This shows an uneven distribution of media industry activity across the country.

To collect the data, two sources were used: interviews and documents, such as reports, journal articles and conference proceedings. The documental analysis represented the preliminary phase finalized to acquire a general understanding of specific characteristics of the content industry and to identify people to interview. The approach was explorative, the questionnaire contains open-ended questions and the answers provided by the interviewee reflected his personal experience. An exploratory interview consists in asking questions about a specific topic, including the particular point of view of the interviewee (Yin, 2003; Oppenheim, 2000).

The questionnaire is organized around three main topics that focus on distinct issues. The first set includes general questions aiming to understand the job

and the role of the interviewee and to capture new aspects of the media industry economic context. In this set, questions about the interviewee working life and the interviewee perception of the media industry characteristics were asked. The second set concentrates upon organizational characteristics of projects in the media industry. Questions focused on details of projects the respondent was involved in, their organization and elements of governance present in the projects: contractual as well as extra-contractual. The last section pinpoints the processes of knowledge acquisition and retention, investigating the role of tacit/explicit knowledge, the presence/absence of knowledge sharing processes. The questions used are reported in the appendix.

The majority of the contacts have been made by the first author, participating to a workshop organized for people working in the media industry. The event was held in London, in June 2006. The length of the interviews was between 40 and 120 minutes. Data was collected between May and July 2006 in London and surroundings. A detailed list of the people interviewed, date, time and venue can be found in table 1. The 13 interviewees have been selected to be representative of the different kinds of professionalisms present in a media industry project: cameramen, producers, production assistant, location manager, editor, director, actor, photographer, researcher, and writer. The first author conducted all the interviews; the latter have been tape recorded and transcribed integrally, in order to not lose any detail of the conversation.

4. Knowledge dynamics: processes and moderators

Nowadays no economic sector is immune either from high competition among its internal players and threats from external ones, or from the likelihood to face unpredictable changes. On the one hand, such conditions have made knowledge become one of the most important resources to rely on in any industry (Grant, 1996; Kogut and Zander, 1992). On the other hand, they have made inter-organisational networks the most preferable way of performing economic activities in many industries (Miles and Snow, 1986; Powell and Smith-Doerr, 1994). As argued in evolutionary theory, knowledge implies something different and additional to information (Ancori et al., 2000; Dosi et al., 1996). Whereas a piece of information may be represented by “well stated and codified propositions about (i) states of the world,(ii) properties of the nature....(iii) identities of the other agentsand explicit algorithms on how to do things”, knowledge is made up of “(a) cognitive categories; (b) codes of interpretation of the information itself; (c) tacit skills, and (d) search and problem solving heuristics irreducible to well defined algorithms” (Dosi et al., 1996 : 24).

Prencipe and Tell (2001) distinguish the mechanisms through which project-based organisations learn from experience according to the level at which they are enacted, respectively individual, project and organisation . All mechanisms are complementary to each other and allow project-based organisations to transfer knowledge acquired in a given project to successive ones or to other parts of the organisation. In line with Prencipe and Tell (2001), we distinguish among three levels at which knowledge dynamics take place. In the UK media content production industry, the absence of a formal

organisation persisting beyond the project brought some authors, such as De Fillippi and Arthur (1998), Lampel et al. (2000), Tempest and Starkey (2004) to assume that the broader level at which knowledge acquisition and retention are favoured in fragmented industries is represented by the industry itself. Drawing on such considerations, we distinguish variables involved in knowledge dynamics in fragmented industries in three groups, according to the level they are enacted. The levels correspond to the typology of actors that can manage them. They are respectively, individuals (micro level), project managers (meso level), industry (macro level).

Drawing on data collected and on the existent literature we propose an analytical model that describes dynamics of knowledge acquisition and retention in fragmented industries. By knowledge acquisition we refer to the process of augmenting the existing stock of knowledge. By knowledge retention we refer to the process of possession and use of previously acquired knowledge, namely to the process of “embedding knowledge in a repository so that it exhibits some persistence over time” (Argote et al., 2003 : 572). Previous literature already identified variables involved in knowledge dynamics and the analysis of the empirical evidence collected confirms previous contributions. However, we still do not know how those variables interact with each other and what role they play in the two processes of knowledge acquisition and retention. The analysis of the variables and their systematization into a model allow us to shed further light on those processes.

The model differentiates between two types of variables, that we call processes and moderators. Processes represent the proper way to acquire or retain knowledge, while moderators impact on the process of knowledge acquisition or retention augmenting or diminishing the effectiveness of the process itself. Moreover, all variables have been divided also according to the level at which they are enacted: micro, meso or macro. Micro variables are managed by the individual independently from the interaction with colleagues in a project. For example, class training, geographical proximity or learning by watching can be controlled by the individuals independently from either their involvement in a project or the activities of the industry. Meso variables are enacted during the project execution. For instance, fixed role structure, learning by observing, previous work experience deploy their effects while performing a project. Finally, macro variables are related to the structure and dynamics of the industry, such as the role of contracts, the existence of networks and the knowledge sharing process. The remainder of the section illustrates the model describing how the variables interact with each other and why they are divided into processes and moderators. The analytical model is reported in fig. 2.

 fig 2 approx here

4.1 Micro-level: knowledge acquisition and retention variables managed by the individual

– Product Observation

According to our interviewees, learning can occur watching other people's works, others' movies. Watching others' movie is the way in which directors learn what style they like and shape their own. A good director has to know how he likes the story to be told and what kind of actors he wants in it, what he wants his film to look like, once it is finished. He does not need to know how to shoot a film. Hence, in the case of directors, there is a neat distinction between "knowing what" and "knowing how". Directors have to acquire the former, whereas the latter does not seem to be important at all. "Knowing what" represents knowledge about "the state of the world", (Edmondson et al., 2003 : 199), and it can be easily articulated and shared through a symbolic language (Polanyi, 1967).

The process just described is what we define learning through product observation. It may be positively moderated by the impact of the variable called product observability. This happens when, during the execution of a project, the director facilitates the understanding of what he wants the film to look like by showing to his crew another movie either of his or of other directors. This is valid for all the film crew, both for cameramen, light and sound people and for actors. In this way they can understand what the director wants. This approach followed by directors to explain how the final product should look like reminds us the product observability dimension of knowledge, identified by Winter (1987) and borrowed by Zander and Kogut (1995). Product observability refers to the opportunity of understanding the knowledge informing the production of a good, simply looking at the good itself. Such ability relies on skills and knowledge related to similar products. This happens also in the analysed context.

– Class Training

Intensive courses at Universities or colleges are a way to acquire skills to work in the media industry: some of our interviewees attended them. According to them, university courses provide the basics: in some cases. Although in some cases courses are too theoretical, a new tendency is emerging. Universities started training their students focusing more on the needs of the industry. Despite of this new tendency, there is still the risk that, once out of the school, what students have learnt is already out of date. To update their skills they have some options: they can start working for broadcasters like BBC, and benefit from training opportunities offered by the broadcaster or attend courses offered by training or union institutions like "Skillset", "Film London", "Arts Council": these courses, according to our interviewees, are useful to fill the gap between the academic training and the industry needs.

As one of our respondents explained, notwithstanding the opportunities of off-job training, freelancers find it difficult to attend these courses because they do not have either time or money. What many of them do, is entering the industry as a runner, the entry level "qualification" and "hit the ground running" to learn (interviews transcript). Hence, much of the learning occurs on-job.

Our finding is in line with what Orr (1990) and Brown and Duguid (1991) state. Learning in a classroom, on a textbook, does not provide the ability to master all the details and the contingencies involved in performing a task in the work environment. The latter represents the context in which much of the learning occurs (Brown and Duguid, 1991). This is also consistent with De Fillippi and Arthur (1998) and Artcliff et al. (2007) studies.

4.2 Meso level: Knowledge dynamics in the project execution

- Common experience accumulation

Interviewees pointed out that for people part of the media community, London is like a small village. People know each other because they work together and usually people like repeating different projects with the same people. Sharing previous working experience with colleagues facilitates “short-out working relationships” among the members of the film crew. People already know each other, “know what the other wants”; this allows to communicate in a quicker way. This is true particularly if we analyze the relation between the director and the editor: those two professionalisms often spend several months stuck together in a room after the film has been shot. Interviewees claimed that, after a while, they start “reading each other mind” and they do not need to “spell everything out”. This harmony requires time to be developed: for this reason, common work experience allows time saving and greater understanding among team members. Another reason pointed out by our respondents is that in low budget films it is preferable to work with trustworthy people. Although all respondents recognize the advantages of common work experience, some of them identify advantages also in working with someone new. In fact, this can bring a fresh perspective, a new approach and new ideas to the work.

According to Nonaka (1994) and Nonaka and Takeuchi (1995) a period of common experience accumulation allows people to articulate knowledge through analogies, metaphors and hypothesis. Common experience accumulation allows individuals to acquire common skills and beliefs, trust and shared world views. The phenomenon of common experience accumulation in project-based contexts is well recognised in literature. Both Grabher (2002) and Starkey et al (2000) emphasised that working with either the same people or people recommended by friends brings about the reconfiguration of project ecologies and latent organisations over time. However, Grabher (2002) showed how slight changes to the project team composition bring about freshness and creativity, fundamental in project-based environments.

The process of retaining knowledge through common experience accumulation is positively mediated by the impact of the fixed role structure that is possible to identify across projects. Media industry projects usually start with a script. In fact, the system and the hierarchy are similar in every project. For this reason, it is very easy to start working in a new project. Everything is really structured: there is a production side, with a producer, a line producer, a production manager, a production assistant, a location manager and there is a

creative side with director, designers, actors and technical people. One interviewee pointed out that film crews tend to be organised like the army. As he explained, films became business in the UK after the II World War. “They were run by officers...so everything has been organised historically in regimental troops. Even if people recruited for a given project have not worked together before, there is a common understanding about how the whole system normally works. Whatever the field, there is a very similar approach in the practical business of filming, so it is not necessary reinventing the process every time...”. This organization is necessary because shooting a movie can be very expensive and the resources have to be used in the best possible way. This hierarchical and rigid organization allows people to understand perfectly what is happening in a film set although they have just arrived.

A clear role structure allows individuals to switch from one role to another across projects (Bechky, 2006; Bigley and Roberts, 2001). This is very important in this industry due to the high percentage of freelance-based job; in fact, it looks difficult to replicate the project structure with the same people over time. People switch from a crew to another and the standardization of roles allows them to easily understand how their work is positioned in the whole project. So, the retention of knowledge enabled by previous common experience is facilitated by the existence of a shared, unique and fixed division of labour across projects.

- Learning by doing

Learning by doing is the more effective way to learn: according to our respondents, practicing is important during the execution of a project as well as during rest periods. As one of them emphasised, learning actually takes place on the job, because learning is “problem solving and ...crisis management...and there is nothing like real situation to really get you focussing and concentrating your mind on those sorts of issues”. The opportunities of learning are higher in big projects as inexperienced people have more chances to work with experts that can mentor them.

Furthermore, most people are not shooting films all the time. When they are not working, they risk losing interest in and feedback from the industry. A respondent noticed that, if everyday he is at least filming, writing or working in some way, he still can acquire knowledge to be used when he is actually working on a project. As he explained, many people do not do that: for them every new project is like starting from scratch. Moreover, this industry is very fast moving: everything can change in a year, especially technologies. Being active is fundamental to be constantly updated. As discovered in the aircraft industry by (Wright, 1936), and proved occurring also in other industries, performing the same tasks over time increases the ability of individuals to master the tasks. Known as learning by doing, improvements in performing a task bring about cost and time savings (Epple et al., 1991). Nonaka (1994) and Nonaka and Takeuchi (Nonaka and Takeuchi, 1995) showed that the individual may acquire the technical skills informing a competent performance by observing an experienced individual while executing the skill, trying to imitate him and practising it over time.

The acquisition of knowledge enabled by the process of “learning by doing” is mediated by the impact of the moderator secretive attitude, that negatively affects it. In fact, in every social context, besides of people who trust each other and meet socially, there are also people who present a secretive attitude. They tend to withhold information with the fear of being copied: they keep secret what they know or what they do. Their attitude is justified by the high competitiveness that characterizes this industry. It is not possible to copyright an idea, so some people do not talk about their experiences. Some interviewees pointed out that “it is very easy for someone to overhear you and just get the money to make it first”. This kind of attitude has been described also by (Alchian and Woodward, 1988): they defined it moral hazard (Jones et al., 1998). The possibility to learn from experience is diminished by the attitude of those people that do not give advice or comments to newcomers.

The process of learning by doing plays an important role also in the retention of knowledge across projects. From this view point, the effect of such process is moderated by the variables fixed role structure and specialization. Both of them have a positive impact. The recurrence of role structure and hierarchy across projects makes possible easily use in successive projects what has been learned in a precedent one, even though content, script and purpose are completely different. For example, being involved in the industry may mean also shooting commercials. Also commercials represent a good occasion to learn and, due to the presence of repeated routines, the effect of knowledge retention is amplified. Without a fixed role structure, much of the learning that occurs while practicing would be lost, with no possibility to reuse it.

The second moderator that positively impacts on knowledge retention is the specialization of roles that occurs in the industry. According to our respondents, usually cameramen only work with the camera, soundmen only with sounds, costume people only work with costumes. However, the smaller is the project, the more likely is to find people that are doing two jobs. In low budget projects all the roles are respected and clearly defined, but there is one person doing more things. Usually, in small projects, 5-6 people make up teams: there is a director, a producer (that is involved with all the business related issues), a production manager (that is involved in booking accommodation and other practical activities), a researcher (if the project is a documentary), a cameraman, a soundman and sometimes a light expert. Specialization in different roles facilitates the acquisition and retention of knowledge obtained by practicing and learning by doing. This is consistent with Bigley and Roberts study (2001). Analysing the approach used by USA government agencies to face emergency situations, the authors identified a constant structure made up of given functions. Those functions are implemented every time in a way that is consistent both with the availability of resources as well as with the nature and the size of the particular emergency to be faced.

- Learning by observing

Interviewees were unanimous in pointing out that a way to learn is observing how other people perform their tasks. People at the first stage of their careers acquire knowledge mainly watching how other people work. In this way they learn what shooting a movie really means. The learning process is accelerated if they are curious, they “watch everything, notice everything and teach themselves”. As one interviewee explained, it is possible to ask production or post-production companies to go and spend a day with them: “they can take you through how it works”.

Learning by observing can be considered as part of that learning process that Lave and Wenger (1991) named legitimate peripheral participation and is consistent with De Fillippi and Arthur (1998) and Perretti and Negro (2007) studies. De Fillippi and Arthur (1998) showed that inexperienced people plays roles of less responsibility; that allow them to run around, to watch other people working and understand how different tasks interrelate to each other. New members have the opportunity to understand how various tasks are performed and to gain a comprehensive view of whole project.

Thus, learning by observing is the process trough which newcomers acquire knowledge. However, the amount of knowledge acquired is influenced by the action of two moderators: secretive attitude and fixed role structure. In fact, if people working with newcomers do not want to disclose how they perform their job, the process of learning by watching is less effective. In this case, we see that a secretive attitude impacts negatively on the process of knowledge acquisition. The learning process is facilitated if more experienced people recognise new members as part of the crew and allow them to get in touch with as many learning opportunities as possible (Lave and Wenger, 1991).

The other moderator, fixed role structure, has a positive impact on the acquisition of knowledge enacted by the process of learning by observing. Newcomers, at their first project, may have problems with understanding who is doing what since the division of labour within film project teams is strict and tacit. Nobody has to explain to a cameraman what his role is and who is going to give him orders and to whom he can order something. Hence, a similar crystallized structure facilitates (i) the identification of the different roles (who is doing what), (ii) the understanding of how the relative tasks are performed (iii) how different project activities relate to each others. As the role structure is fixed across projects, the knowledge acquired can be retained in successive projects.

4.3 Macro level: knowledge dynamics at the industry level

– Knowledge sharing

Among technical people, like cameramen, light people, sound people and editors, it is common to ask peers some advice to solve problems faced during current or past projects. Knowledge sharing occurs either at social events organised within the industry, in forums over Internet as well as in informal settings. It is important to keep up to date on technologies: latest technologies are often presented at conferences and events organised by

industry organisations, that constitute a primary place where to share and acquire knowledge among peers. A similar occasion for knowledge sharing is offered also to artistic people: industry organizations organize workshops and conferences for directors and filmmakers from all over the country. It is a place where they “gather together and share their skills with each others, watch each other movies, comparing them”.

Especially for freelancers, reading publications, going the those events, talking to friends represent the way to keep on top of what is happening. It is sufficient to keep engaged with other people and have conversations about software, cameras etc.. According to a respondent, knowledge sharing is very important to pursue a long life career. This finding is consistent with what has been highlighted in other contexts such as the diffusion of open source software. Such diffusion is due to the willingness to share with peers the solution found to particular technical problems (von Hippel and von Krogh, 2003). As to the artistic side of knowledge sharing, this is quite similar to what occurs within academia, where ideas are freely shared and peer reviews represent the best way to improve the achieved results (Dahlander, 2007).

Three moderators impact either on the opportunity or on the amount of knowledge that can be acquired through the process of knowledge sharing. Such moderators are (i) geographical location, (ii) secretive attitude and (ii) networks. By geographical location, we refer to the fact that in a fragmented industry, it is very important to live close to an existing media community. In UK, several media communities exist all around the country. However, for television and movies, the most important one is based in Soho (London). Interviewees pointed out that just hanging out in bars, it is possible to meet other people, discuss about work, encounter job opportunities, being aware of social events and other relevant peaces of information. Interviewees that do not live there, have to commute at least once per week: staying close to where the community lives increases the chances to get in touch with the right people and get information about any opportunity to learn and work. Moreover, living close to a media cluster increases the chances an industry member has to meet peers in a bar, pub and ask for some advice, maybe in front of a beer. In this way, technical people may solve problems they are facing and actors may get aware of new job opportunities. There is a large amount of studies in the literature on innovation that pointed out the central role of geographical proximity in the diffusion of tacit knowledge and innovations (Sonn and Storper, 2003; Desrochers, 2001).

The chances and effectiveness of knowledge acquisition through knowledge sharing can be undermined by the secretive attitude of the people the individual interacts with. For example, despite of the informal environment where people may meet, some individuals may be unwilling to suggest possible solutions, to share information to help peers sorting out doubts and problems they are facing. Of course, a similar attitude impacts negatively on the process of acquiring new knowledge.

The last moderator that affects the process of knowledge acquisition is the presence of networks. In fact, networks augment the opportunity to acquire knowledge and the amount of information obtained through knowledge

sharing, since networks provide industry members with a context, formal or informal, where to share knowledge. The respondents emphasized the importance of social relationships in the media industry. Two kinds of networks have been identified: a formal one, through which funds circulate and an informal one, through which ideas and names flow. People are always looking for places to go to meet new people and hopefully to make new contacts. There are loads of different networks and networking events: for example, in network events like “Shooting People”, people go there to find others to work with and people they can employ. One respondent gave an example of a networking event called “speed networking”: “basically you can go along and you can spend few minutes talking to each other about what you are doing and what your skills are and what you are looking for. You swap business cards and then you move on to the next”. The diffusion of this kind of events is due to the difficulties in finding people with the right skills.

While a list of contacts assures an individual to be recruited for a new project, personal relationships become fundamental to make the film crew terminate the project. Some interviewees pointed out, for instance, that directors may prefer to hire cameramen who are not brilliant technically, but have very good social skills, who are very good at working in a team and under pressure. As a respondent pointed out: “If you don’t get on with somebody then you can’t work together”. Personal networks emerging during one project tend to last beyond the project itself and assure the individuals future work experiences (De Fillippi and Arthur, 1998; Grabher, 2004). Furthermore, social skills may result more important than technical ones in order to reach the results a given project is aimed to, given the high probability of working under time and cost constraints (De Fillippi and Arthur, 1998; Grabher, 2004; Starkey et al., 2000).

Knowledge sharing plays an important role also in the knowledge retention process. Such a process has different effectiveness according to the impact of four moderators, such as (i) secretive attitude, (ii) product observability, (iii) networks and (iv) contracts. Secretive attitude and contracts are likely to have a negative impact on the amount of knowledge retained, whereas product observability, specialisation and networks may increase it. Secretive attitude may undermine the attitude of the industry to retain knowledge. Once industry members have acquired some knowledge, they may be unwilling to share it with other people in the industry. As we have seen also for the previously discussed processes, secretive attitude obviously impacts negatively on the knowledge dynamics because the flow of information and knowledge is interrupted by the action of this moderator.

Product observability impacts on the retention of knowledge generated by knowledge sharing in the following way: whenever a director shows to his crew others movies to explain how the final product should look like, the amount of knowledge shared and retained is higher. This occurs because the knowledge involved in the production of such movies can be inferred and easily transferred by watching the final product. Another moderator is represented by networks. In fact, networks and events may increase the chances to share and retain knowledge at the industry level, because they

provide the individual with the opportunity to share his knowledge with a larger number of people in both formal and informal ways.

The last moderator is represented by contracts. This moderator has a negative impact since it may reduce the possibility to disclose knowledge previously acquired. A project participant can be obliged by contract to sign a confidentiality agreement. However, according to most respondents, verbal contracts are more common than written ones. The industry is small and if, for example, a producer or an actor does not respect what has been previously agreed, the chances he or she can work again are very low. A respondent said “if I mess up I never work again because my name becomes bad in the industry, people will not recommend me.” Another one said, “it is an industry based on reputation and how nice you are and how good you are at your job and who you know”. For this reason, although the presence of confidentiality agreements within contracts obviously impacts negatively on the retention of knowledge, the use of contracts is rare and their effectiveness is limited.

5. Discussion and Conclusions

The importance of understanding knowledge dynamics and related learning effects occurring in inter-firm projects is an issue largely debated among both researchers and practitioners. In fact, literature on projects (Prencipe and Tell, 2001) emphasized the advantages of temporality and flexibility, pointing out also the inevitable losses of knowledge and learning. Rupture with previous work experience forces individuals and organizations to reorganize their existing knowledge. A project-based approach largely affects the process of knowledge acquisition and retention at individual, project and industrial level. With the present work we aimed to contribute to this debated issue, offering a deeper understanding of the knowledge dynamics occurring in fragmented industries. Fragmented industries are characterized by inter-firm projects whose participants are mostly freelancers that are likely to change across projects. The organisation created to perform the particular project does not survive to the end of the project itself but is likely to come to appearance again when a new project as to be performed. The particular resources are likely to change across projects, though.

The aim has been achieved collecting fresh empirical evidence in the UK media industry. The discussion of the evidence collected enabled us to develop the analytical model reported in fig 2. The model offers a picture of how the variables, identified on the basis of both literature and empirical evidence, interact with each other while enabling knowledge dynamics. Variables have been distinguished according to the level at which they are enacted (micro, meso and macro) and according to their attitude to act as moderators or process in favouring the knowledge retention and acquisition processes. The model summarizes the contribution of the present work; we extend the existing literature on the topic describing in a systematic and comprehensive manner the knowledge dynamics. Variables used in the model have been already identified by the literature but we provide a cross level analysis that deepens the understanding of interactions among variables and actors/players. The discussion of the outcomes of the model lead us to

identify the four main findings that follows: (a) it exists heterogeneity on how independent variables influence the dependent variables; (b) the control over knowledge dynamics is enacted differently according to level itself; (c) the acquisition of knowledge is mainly controlled by individuals; if they do not enact the process itself, still play a strong control moderating the effects of the other variables; (d) the impact of individuals on knowledge retention is limited; it is largely controlled at project level.

From the model emerges clearly that the variables identified in literature and described as influencing knowledge dynamics, do not play the same role. Large heterogeneity exists across variables. Some impact directly (process), others indirectly (moderators). The comprehension of the differences between those is fundamental to control and influence the dynamics of knowledge occurring within any industry. To enable the functioning of a moderation variable without being sure that the related process is enabled may result in no effects on the knowledge dynamics and in wastes of efforts. For example, if individuals are located in the same geographical area (geographical location) but an attitude of knowledge sharing is not diffused in the industry, no new knowledge will be acquired, despite of the territorial proximity.

Processes and moderators are controlled at different levels by different players. This results in differences on how knowledge dynamics are enacted and such differences are due to the role of players in respect to the overall structure of the industry. In fact, as it will be discussed in the remaining of the section, individuals, project managers and policy makers (that operate respectively at micro, meso and macro level) can manipulate different variable and this will result in a smaller or bigger possibility to control the knowledge dynamics. Being aware of that important outcome, may help in framing how different actors can contribute to favour the processes of knowledge retention and acquisition.

Knowledge acquisition process is enhanced mainly at micro level. Individuals are personally responsible of their own preparation and knowledge acquisition. Professional capabilities are acquired through a unique path that is largely dominated by the attitude of each single person, projects and institutions play a marginal role in the knowledge acquisition processes. In fact, also if the process is enabled during the project execution or at the industry level, such as in the case of “learning by doing”, “learning by observing” and “knowledge sharing”, individuals play a strong control moderating the effects on the dependent variable.

Despite of the large role in influencing the process of knowledge acquisition, individuals have very limited impact on retaining knowledge; knowledge retention variables act mostly at meso level. Being aware of that help in framing the contribution of the different actors/players to the whole knowledge dynamics. Knowledge retention is influenced by the structure of the project and by the way people included in the projects are selected. The role of the project manager in selecting the appropriate people is central to increase the retention of previously created knowledge. Another important factor is the common organizational structure adopted in media projects. In fact, a

common basis is essential to coordinate and replicate projects that largely differ among them in terms of content, characteristics and people. The shared organizational structure acts as common element able to unify diverse experience.

At a macro level few variables have been individuated. A possible interpretation of the scarce role that institutions have on knowledge creation and retention processes resides in the fragmented structure of the industry itself. Understanding how learning experiences occurring in inter-firm projects can be retained over time is relevant for practitioners and policy makers in order to enhance the competitiveness of firms and industries. Especially relevant for policy makers is the scarce role of institutions and the strong role played by project management in influencing knowledge dynamics.

The present work has some limitations related to the generalizability of findings. As to the method, number of people interviewed is limited; however, we selected our interviewees to give voice to all the different types of professionalisms operating in the media content industry. Moreover, the limited number of interview allowed us to conduct deeper and longer interviews, having a greater understanding of the analysed issued. A replication of interviews in other national contexts or in different industries will confirm the validity of findings.

Applications of reported findings in different industries are possible, having previously considered the main characteristics of the empirical setting of this study: the media industry over the past twenty years has gone through an increasing fragmentation. This makes our findings liable of application in industries characterised by similar project execution dynamics; industries in which multi-firm projects are executed by co-located sub-teams. Some of the processes and the related moderators involved in the knowledge acquisition and retention dynamics in the media industry are present in industries in which the career path is not very linear or standardized but mastered by the individual himself. The present work provides a comprehensive picture of dynamics of knowledge acquisition and retention occurring in fragmented industries, but it does not claim to be exhaustive. The opportunities to control knowledge processes and moderators may change across industries and time. Hence, a possible avenue for future research is represented by the investigation of how the interactions identified occur in other fragmented industries, to analyse if the relevance of each interaction changes according to specific contingency factors.

References

- Alchian, A., Woodward, S., 1988. The Firm is Dead Long Live the Firm: A Review of Oliver Williamson's "The Economic Institution of Capitalism". *Journal of Economic Literature* 26 65-79.
- Ancori, B., Bureth, A., Cohendet, P., 2000. The economics of knowledge: the debate about codification and tacit knowledge. *Industrial and Corporate Change*, 9 (2), 255-287.
- Antcliff, V., Saundry, R., Stuart, M., 2005. Freelance Worker Networks in Audio-Visual Industries. Lancashire Business School Working Papers University of Central Lancashire.
- Antcliff, V., Saundry, R., Stuart, M., 2007. Networks and social capital in the UK television industry: The weakness of weak ties. *Human Relations*, 60 (2), 371-393.
- Argote, L., Mcevily, B., Reagans, R., 2003. Managing Knowledge in Organizations: An Integrative Framework and Review of Emerging Themes. *Management Science*, 49 (4), 571-582.
- Bechky, B. A., 2006. Gaffers, Gofers, and Grips: Role-Based Coordination in Temporary Organizations. *Organization Science*, 17 (1), 3-21.
- Bigley, G. A., Roberts, K. H., 2001. The Incident Command System: High-Reliability Organizing for Complex and Volatile Task Environments. *Academy of Management Journal*, 44 (6), 1281-1300.
- Brady, T., Davies, A., 2004. Building Project Capabilities: From Exploratory to Exploitative Learning. *Organization Studies*, 25 (9), 1601-1621.
- Brown, J. S., Duguid, P., 1991. Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovating. *Organization Science*, 2 (1), 40.
- Cacciatori, E., 2004. Organizational memory and innovation across projects: integrated service provision in engineering design firms. Electronic working Paper No. 17. SPRU, University of Sussex.
- Dahlander, L., 2007. Penguin in a new suit: a tale of how de novo entrants emerged to harness free and open source software communities.
- Davies, A., Brady, T., 2000. Organizational capabilities and learning in complex product systems: towards repeatable solutions. *Research Policy*, 29 931-953.
- Davies, A., Hobday, M., 2005. *The Business of Projects*, Cambridge University Press
- De Fillippi, R., Arthur, M., 1998. Paradox in project-based enterprise: the case of film making. *California Management Review*, 40 (2), 125-139.
- Defillippi, R., Grabher, G., Jones, C., 2007. Introduction to paradoxes of creativity: managerial and organizational challenges in the cultural economy.
- Desrochers, P., 2001. Local Diversity Human creativity and technological Innovation. *Growth and Change*, 32 (3), 369-394.
- Dosi, G., Marengo, L., Fagiolo, G., 1996. Learning in Evolutionary Environments. IIASA Working Paper.
- Edmondson, A. C., Winslow, A. B., Bohmer, R. M. J., Pisano, G. P., 2003. Learning How and Learning What: Effects of Tacit and Codified Knowledge on Performance Improvement Following Technology Adoption. *Decision Sciences*, 34 (2), 197-224.

- Epple, D., Argote, L., Devadas, R., 1991. ORGANIZATIONAL LEARNING CURVES: A METHOD FOR INVESTIGATING INTRA-PLANET TRANSFER OF KNOWLEDGE ACQUIRED THROUGH LEARNING BY DOING. *Organization Science*, 2 (1), 58-70.
- Grabher, G., 2002. The project ecology of advertising: tasks, talents and teams. *Regional Studies* 36 (3), 245-262.
- Grabher, G., 2004. Temporary architectures of learning: Knowledge governance in project ecologies. *Organization Studies*, 25 (9), 1491-1514.
- Grabher, G., Ibert, O., 2006. Bad company? The ambiguity of personal knowledge networks. *Journal of Economic Geography*, 6 (3), 251-271.
- Grant, R. M., 1996. Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal*, 17 Spi 2 109-122.
- Hobday, M., 1998. Product complexity, innovation and industrial organization. *Research Policy*, 26 689-710.
- Jones, C., Hesterly, W. S., K., F.-L., Borgatti, S., 1998. Professional Service Constellations: How Strategies and Capabilities Influence Collaborative Stability and Change. *Organization Science*, 9 (3), 396-410.
- Kogut, B., Zander, U., 1992. Knowledge of the firm, combinative capabilities and the replication of technology. *Organization Science*, 3 (3), 383-397.
- Lampel, J., Lant, T., Shamsie, J., 2000. Balancing act: Learning from organizing practices in cultural industries. *Organization Science*, 11 (3), 263-269.
- Lave, J., Wenger, E., 1991. *Situated learning : legitimate peripheral participation*, Cambridge University Press. Cambridge
- Levitt, B., March, J. G., 1988. Organizational Learning. *Annual Review of Sociology*, 14 319-340.
- Miles, R. E., Snow, C. C., 1986. Organizations: New Concepts for New Forms. *California Management Review*, 28 (3), 62.
- Newell, S., Bresnen, M., Edelman, L., Scarbrough, H., Swan, J., 2006. Sharing Knowledge Across Projects: Limits to ICT-led Project Review Practices. *Management Learning*.
- Nonaka, I., 1994. A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, 5 (1), 14.
- Nonaka, I., Takeuchi, H., 1995. *The knowledge-creating company*, Oxford University Press. New York
- Oppenheim, A. V., 2000. *Questionnaire Design, Interviewing and Attitude Measurement*, Pinter. London
- Orr, J. (1990) *Sharing Knowledge, Celebrating Identity: War Stories and Community Memory in a Service Culture*. IN MIDDLETON, D. S., EDWARDS, E. (Eds.) *Collective Remembering: Memory in Society*. Beverley Hills CA: Sage Publications.
- Perretti, F., Negro, G., 2007. Mixing genres and matching people: a study in innovation and team composition in Hollywood.
- Polanyi, M. (Ed.) (1967) *The tacit dimension* New York, NY: Ancor.
- Powell, W. W., Smith-Doerr, L. (Eds.) (1994) *Networks and Economic Life*.
- Prencipe, A., Tell, F., 2001. Inter-project learning: processes and outcomes of knowledge codification in project-based firms. *Research Policy*, 30 (9), 1373-1394.

- Sonn, J. W., Storper, M., 2003. The Increasing Importance of Geographical Proximity in Technological Innovation: An Analysis of U.S. Patent Citations, 1975-19971. What Do we Know about Innovation? in Honour of Keith Pavitt, Sussex, 13-15 November 2003.
- Starkey, K., Barnatt, C., Tempest, S., 2000. Beyond Networks and Hierarchies: Latent Organizations in the U.K. Television Industry. *Organization Science*, 11 (3), 299-305.
- Sydow, J. R., Staber, U., 2002. The Institutional Embeddedness of Project Networks: The Case of Content Production in German Television. *Regional Studies*, 36 (3), 215-227.
- Tempest, S., Starkey, K., 2004. The Effects of Liminality on Individual and Organizational Learning.
- Von Hippel, E., Von Krogh, G., 2003. Open Source Software and the 'Private-Collective' Innovation Model: Issues for Organization Science. *Organization Science*, 14 (2), 209-223.
- Windeler, A., Sydow, J. R., 2001. Project Networks and Changing Industry Practices – Collaborative Content Production in the German Television Industry. *Organization Studies* (Walter de Gruyter GmbH & Co. KG.), 22 (6), 1035.
- Winter, S. (1987) Knowledge and competence as strategic assets. IN TEECE, D. (Ed.) *The competitive challenge - Strategies for industrial innovation and renewal*. Cambridge, MA: Ballinger.
- Wright, T. P., 1936. Factors Effecting the Cost of Airplanes. *Journal of Aeronautical Sciences*,
- Yin, R. K., 2003. *Case study research : design and methods*, Sage Publications. Thousand Oaks, Calif.
- Zander, U., Kogut, B., 1995. Knowledge and the Speed of the Transfer and Imitation of Organizational Capabilities: An Empirical Test. *Organization Science*, 6 (1), 76-92.

Appendix: Questionnaire: Knowledge transfer in projects based organizations

- 1 General questions
 - 1.1 About the interviewee
 - Background and professional biography?
 - May you explain the business/activity and how is related to media industry?
 - 1.2 Media industry: general characteristics
 - According to your experience, what are the characteristics of this industry?
 - Size of the companies?
 - To what extend different people/companies collaborate in this industry?
 - Organizations, association etc of content media companies: do they exist?
 - What is their role?
- 2 Organizational characteristics of projects in media industry
 - 2.1 Project
 - It is possible to choose one project in which you participated?
 - Can you provide ma description of the project?
 - Number of people included in the project?
 - Their skills?
 - Overall budget and overall timing
 - Characteristics of the product/service developed?
 - 2.2 Contractual /extra contractual governance
 - Characteristics of the contract?
 - Level of standardization/customization of the contract, compared with the contracts of other projects
 - There are any changes applied to the contract during the project execution?
 - How was the communication between the partners?
 - How frequent?
 - How frequent written and how frequent face to face?
- 3 Process of knowledge acquisition and retention
 - 3.1 Knowledge acquisition and retention
 - How did you learn to do this job?
 - How people usually learn?
 - Is experience important?
 - Is school/university important?
 - 3.2 Knowledge transferring in Project:
 - Knowledge of team members/partners
 - Did partner exchanged knowledge between each other?
 - In which way and how often?
 - How people have been chosen?
 - Do they vary across projects?
 - What are the advantages and disadvantages of changing project members across projects from a knowledge point of view?
 - Are common previous experience important for the success of the project?
 - To what extent?

- In which specific operations common experience is more required?
- Tacit knowledge
- Is face to face interaction important?
- Is social interaction important?
- Is it important that project members came from the same area/share the same experience?
- Explicit knowledge
- What is the role of formal organization on creating/sharing knowledge?
- Do project networks are helped by this kind of organizations?