DEALING WITH TECHNOLOGY ACQUISITION AND ORGANIZATIONAL LEARNING IN FAST GROWING SMES

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Abstract: In the early stages of their development, the informality of internal processes can be seen as an advantage in terms of speed and flexibility for fast growing SMEs, named also HGF (High Growth Firms). This advantage could, however, become a threat as the company crosses a particular size threshold. Internal processes become more complex and this, along with a possible geographical dispersion of the company, leads to more challenging change management issues. From this point onwards, the formalization of internal processes and their management become a priority in order to ensure the firm's stability in the long term. Current pervasive IT technologies such as ubiquitous connections, cloud computing, big data, remote planning and control, to name but a few, are today shaping organizations even in traditional sectors. Moreover, there is a growing offer of organizational support technologies, such as ERPs, CRMs, BIM or Agile project management tools. However, adapting the organization to reap the promised benefits of these technologies, in terms of efficiency, reactiveness and cost reduction, is a challenging task for all companies, and especially so for fast growing SMEs. The present paper proposes a practical methodology for achieving big or small technological transfers in fast growing SMEs. The proposed methodology is a four-stage process, based on the technology transfer process. The deployment of the proposed methodology is illustrated through the case study of a successful, fast growing and globally operating French consumer electronic SME.

Key Words: Fast growth SMEs,HGF, technology transfer, user acceptability, methodology, case study,

Introduction

In the early stages of their development, the informality of internal processes can be seen as an advantage in terms of speed and flexibility for fast growing SMEs. This advantage could, however, become a threat as the company crosses a particular size threshold. Internal processes become more complex and this, along with a possible geographical dispersion of the company, leads to more challenging change management issues. From this point onwards, the formalization of internal processes and their management become a priority in order to ensure the firm's stability in the long term. Current pervasive IT technologies such as ubiquitous connections, cloud computing, big data, remote planning and control, to name but a few, are today shaping organizations even in traditional sectors. Moreover, there is a growing offer of organizational support technologies, such as ERPs, CRMs, BIM or Agile project management tools. However, adapting the organization to reap the promised benefits of these technologies, in terms of efficiency, reactiveness and cost reduction, is a challenging task for all companies, and especially so for fast growing SMEs.

The integration process of this type of organizational support technology requires not only the acquisition of the technology itself, but also a broad internal change management process that could represent a major issue for fast growing SMEs. First, because these companies are focused on the day-to-day tasks that add value in the short term. Second, at the early stage of the firm's life-cycle, nothing was established for managing change. Third, a dedicated change management specialist is rarely a member of their staff.

From the literature review some studies of the main factors have been carried out and conceptual models have been proposed. However, there is still a lack of operational methodologies to enable firms to manage the technological integration process in an efficient manner and to capitalize on their capacity to undertake change. In this paper, we introduce a practical methodology for achieving big or small technological transfers in fast growing SMEs. The proposed methodology is a four stage process, based on the technology transfer process defined by (Gilbert and Cordey-Hayes, 1996). These stages are: *contextualized technological choice*, *technology selection process*, *evaluation of potential solutions* and *solution deployment.*

The deployment of the proposed methodology is illustrated through the case study of a successful, fast growing and globally operating SME. As its market is mainly composed of big companies, it needs to structure its operations in particular around project management processes. At this point, the formalization of the processes and their management become a priority in order to insure the firm's stability in the long term. Moreover, geographically dispersed teams need to overcome previous failures in process structuring and choose a project management support software tool adapted to the firm's dynamics and managerial organization.
This methodology gives the MOT field a scalable methodology, both for important projects that have a company-wide impact as well as for smaller projects. It also provides accessible stages, allowing everyone to get involved in managing technology transfer and tackling this type of problem. Moreover, this methodology brings a new systematic contextualization and questioning of this why the focus on this technological transfer. The proposed approach now has to be more widely tested with different size projects and firms from different sectors.

2. Literature review / overview of technology absorption on fast growing SMEs.

As stated by (Almus, 2002), new firms are a driving force in overcoming existing economic structures, and mainly the transformation from traditional industrial sectors to the e-economy. These new firms, called also HGF (High Growth Firms) often knowing periods of fast growing from the early stages of their life cycle represent, for policy makers the promise of a successful economic renewal. As summarized by (Brown and Mawson, 2015) HGF have been identified by several researchers as key contributors to economic growth by many reasons such as their high innovation levels, productivity and employment creation. A HGF is defined by the OECD as 'an enterprise with average annualized growth (in number of employees or turnover) greater than 20% per annum, over a three year period, with a minimum of 10 employees at the beginning of the growth period'(OECD, 2008).

The high growth process has a virtuous effect in creating competencies and strategies in this type of firms (Brown and Mawson, 2015). Indeed, it seems that HGFs develop strong levels of dynamic capabilities represented by more sophisticated business models and close end-user engagement, who capitalized most successfully on these international growth opportunities (Saarenketo et al., 2004; Teece, 2014).

However, as stated by (Parker et al., 2010) that gazelles « *have difficultly sustaining their frenzied pace of growth*» as organizational complexity increases. Moreover, in their research (Liao et al., 2003), thanks to a longitudinal study of more than 1000 growth oriented SMEs in USA, found that growth oriented and responsiveness SMEs' abilities are expected to increase if they have well developed capabilities in external in knowledge acquisition and intra-firm knowledge dissemination. In other (Salojärvi et al., 2005), found that sustainable high growth of a set of 108 finish SMEs was correlated to their maturity of knowledge management practices.

Concerning the integration process of organizational support technologies, a recent study (Setia and Patel, 2013), shows that whereas companies are investing massively in IT technologies to manage operational capabilities, the mere acquisition of these technologies does not insure the organizational competitiveness. They focused on the process of operation management capabilities through the Information Systems (IS) design and integration. The link has been made through a multi-respondent survey of 153 manufacturing companies in the USA. Other studies such as those of (Alshamaila et al., 2013; Gangwar et al., 2015) proposed theoretical frameworks to understand the critical factors of cloud computing. In other (Kooli-Chaabane et al., 2014) proposed a model to identify activities and success factors of technology transfer in industrial clusters. In despite of the plentiful literature about this issue, to the best of our knowledge, there is a lack of operational methodologies to support the organizational support technology deployment in such High Growth Firms. In the next section, a methodology based on the technology transfer process (Gilbert and Cordey-Hayes, 1996) that describes the process of knowledge transfer that allows organizations to achieve technological and organizational change. That is, building the competencies that allow the organization to become a "learning organization". The model proposes four main activities: *Acquisition, Communication, Application and Assimilation* to allow the new technology to become a routine process within the firm. Our main argument is that this model must be contextualized and adapted to the firm's users' needs. To achieve these elements of the TAM (Technology acceptance model) of (Davis, 1985; Venkatesh et al., 2003) and AHP Analytical Hierarchical Process (AHP) (Saaty, 2008) are integrated in the proposed methodology.

3. Proposal of an operational methodology to deploy an organizational support technology in HGF's.

The proposed methodology for achieving adoption of an organizational support technology in HGFs, as mentioned before is based on the conceptual model proposed by (Gilbert and Cordey-Hayes, 1996) is composed of four main stages (Figure 1): *contextualized technological choice*, *technology selection process*, *evaluation of potential solutions* and *solution deployment.* These stages will be detailed in the next paragraphs.

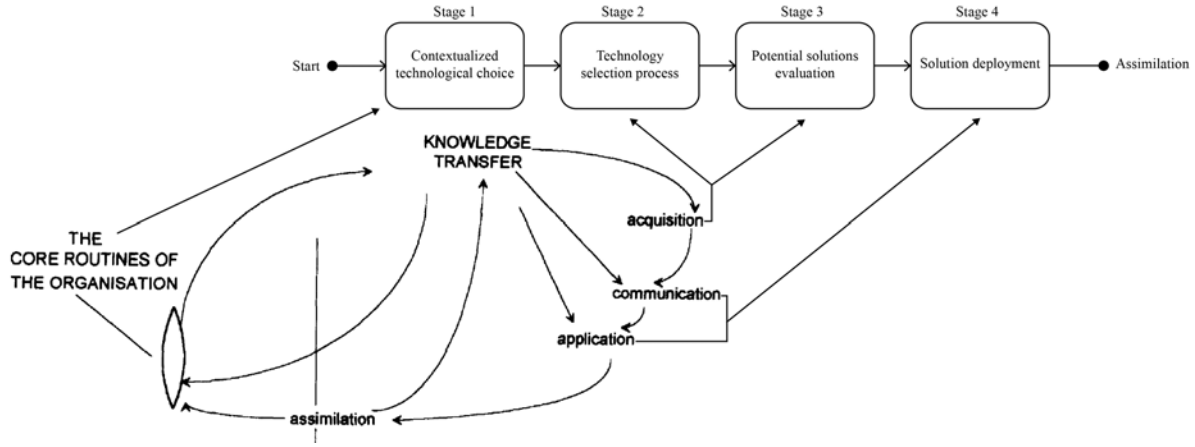

Figure 1 Overview of the methodology to deploy organizational support technologies

Stage 1: Contextualized technological choice

This first stage, allows the decision maker to take into consideration their organizational needs, and see the project from a broader context, including three main elements technological, human, and timing contexts.

Technological context Each technological transfer requires a minimum organizational learning to be aware with the new technology to be integrated. It is, identify the current level of the internal technological capabilities: Physical, Managerial, skills and values (Leonard-Barton, 1995). Also identify the required level to master the technology to be integrated. Recognizing the dimension of this gap will help decision makers to estimate the time an effort to be allocated, but also intermediary stages to achieve the technology transfer process.

Human dimension This element focuses on the human aspects that will affect the technology transfer process. Are the teams open to newness? What is the company culture around change? Most of the changes and projects are top-down or bottom-up proposed? There exist any historical information projects that previously failed or succeed? This makes up help us to determine a human challenge measurement.

Timing and resource context Finally to fulfil our context analysis, this third element, must be explored. Has the team aware of the need of change? Are they already in a formalization process or change dynamics? The team acceptability of the transfer project is correlated to their workload as well. This element will allow managers to identify the theoretical receptivity of the team in terms of hour/person and the level of skills required. Moreover the team conciseness level of the importance of the project must be considered.

Once these 3 elements (technological, human, and temporality) the organization will be then capable to evaluate the global risk linked to this technological transfer and have a better schedule of the activities concerned. Previous learning or technological transfer can also be planned to prepare a bigger one. By extension, these three elements could be followed by the manager to pilot each team's learning.

Stage 2: Technology selection process

As stated in section 1, the field of IT organizational support technologies (ERPs, CRMs, BIMs…) is large and the offer of proprietary to open source tools makes it difficult the decision making process. Once the first stage has been accomplished, the set of the main stakeholders and motivations are then established. This is the basis to feed the technology procurement process. In order to elicit the users' needs and acceptability criteria the TAM (Technology acceptance model) of (Davis, 1985; Venkatesh et al., 2003) used. In accordance with this theory intention of use of the proposed technology depends on the perceived value and the ease of use. The first one explores the service provided to the user by the solution, the second the convenience of the solution. A large quantity of methods to evaluate this technology acceptance has been developed since the first research works of (Davis, 1985). The simplified approach proposed in the present paper is a combination of TAM and multicriteria analysis.

Acceptability factors identifications: for the specific solution factors such as the ease of use, perceived utility, user expectations and functionalities will be evaluated through self-directed interviews.

Elicitation of the Acceptability factors degree of importance: Once a set of acceptability factors is defined, they do not always have the same level of relevance from the users' viewpoint. It means that each criterion has to be weighted or at least prioritized according to the assumptions of the users. There are several solutions, either the decision-maker is able to expressly define the weight (direct weight elicitation), the pairwise comparison of the criteria by the decision-maker as in the Analytical Hierarchical Process (AHP) (Saaty, 2008).

In the end of this stage, an evaluation grid is created enabling a rapid evaluation of asset of technology solutions.

Stage 3: Potential solutions evaluation

The third stage deals systematic evaluation process of technological solutions. Within this stage the following elements will be considered.

Research of solutions a technology search and screening process of potential solutions from different source, including experts, suppliers and Internet to collect the most exhaustive number of possible solutions.

Evaluation of the set of candidate solutions each candidate solution must be evaluated regarding the set of acceptability factors and functionalities. A ten point scale could be used.

Ranking of solutions the use of a multicriteria technique enables to establish a global score for each solution and then rank them according to the user preferences. The solution obtaining the best score corresponds to the best trade-off among the solution functionalities.

This third stage, by working with a corpus of solutions larger as possible that is methodically refined, brings some risk minimization in the decision making process.

Stage 4: solution deployment

The last stage, aims to support the deployment process of the solution for the entire company. It again follows the conceptual model, proposed by Gilbert & Cordey-Hayes. In this model after the acquisitions, for an IT organizational support technology solution, three notions are capital to insure interaction with the users: communication, solicitation and application.

Communication of the selection process The choice an acquisition stage have been achieved, if necessary, a presentation of the solution can be made. First, starting with communication by means of some posters making this change ongoing real and part of collaborator every day. A demonstration and functionalities description of the selected solution could be made. A first solicitation to the potential users could be made, around a basic problems usually faced by them and that could be solved by the new technological solution.

Application, with an individual introduction to the solution, it's time then for personal training on the solution. A trust relation must be established between the "new user" and his trainer. Total available this one has to go along with the users, to establish a confidence climate, and achieved first success.

Solicitation. Some users have richer need around the solution and therefore they can challenge the support team or person, to answer their need thought the solution. Highly reactive and available this support team take a maximum care of the user starting with the new solution, it has to make them feel prime, by over pass their expressed needs, or caring about the visual attractiveness of the solution.

After being challenged, the support team can solicit all the users to make all together few effort, but coordinated, it allows impressive results with a minimum effort. The results that can be immediately awarded thought virtual or real trophy. This trophy to collect, stack the deployment roadmap of the solution. The hall of glory where trophies are collected, allow every collaborator to measure the distance in this technological transfer already converted, and the distance to go. The early next stage for immediate action is also accessible, for volunteer people.
Finally and throughout the whole technological transfer period, to sustain skills acquisitions, an adapted user guide can be written. Released stage by stage this document to support each day learning for collaborators. These documents must be a reference document support and accessible to everyone on the team.

In order to support this technology transfer process, a mix of communication, application and solicitation need to be implemented. A key point at each phase is to explore and evaluate the

kind of communication, application or solicitation action that can be implemented to support users.

4. Case study: integration of a project management tool by a HGF

This study case is about a technological Company in west France region. The concerned HGF, is a very dynamic SME founded in 2008, it designs and produces and delivers home consumer electronics for a niche market. In 2014 the company reaches more than 15 million euros of sales and holds 20% of the European market in its sector face to well established multinational companies. The firm, is an emerging player in its sector, it makes part of mayor events such the CES show in Las Vegas. With more than 30 employees and 4 facilities in three different countries, its core competency is mainly focused on product design and subcontracting. Most of the team members are “knowledge workers” from different disciplines, from design, electronics and software engineering leaded by a charismatic and visionary CEO. From the governance point of view, the organization has a non-hierarchical structure and a participative management is usual leading to take collectively important decisions, making the organization highly creative and flexible. As every single project needs competencies of the different sites that are complementary, launching a new product development project needs a lot of exchanges and share tasks, resources and information. So this activity is becoming a complex task, the firm has decided to integrate a new adapted tool to support the project management.

Stage 1: contextualized technological choice

Technological context Project management (PM) is a non-formalized practice, in the company. The program manager is the only specialist in this field, but due to his many daily tasks, he could not afford the project management practices change. Thus, for example, a technological transfer towards agile project management tool as proposed by the top management cannot be implemented directly. So having a training program on “project management basis, advantages and goals” is a prerequisite to the team before any technology acquisition.
Human dimension A former program aiming to deploy a PM support software failed as their use has been perceived by the team as being a complex counterproductive activity, far from the team work culture. There is an inertial effect and mistrust of the team on this type of tools, making the managers hesitating about any structuration in this area. Another challenge to be faced is the manner to create new shared competencies in a distributed team, as the company has four different facilities in three different countries.
Timing and resources context International important exhibitions such as CES (Las Vegas), are key moment for the firm technologies and offer and creates a workload peak for the team. Outside of this exhibition preparation period, a potential technological transfer could benefit of a period of 4 to 5 months of relative availability of the teams. The team seems aware with the need to change PM practices, and agreed to allocate part of their time to learn and formalize the project management process.

Stage 2 Technology selection process

Following the TAM (*Technology Acceptance Model*) cited in section 2, a list of the Project Management support tool functionalities and users' acceptability criteria must be elicited. Table 1 and Table 2 shows these functions and factors and their the degree of importance. The lists of functions and criteria values were established trough guided interviews with the potential users of the system. The allocated values of weights have been directly computed thanks to the interviews by using an indirect pairwise comparison of the functions as stated by the AHP (*Analytical Hierarchical Process*) method. Details of these computations are beyond the goal of the present paper, for an interested reader those details are presented in (Ishizaka and Nemery, 2013).

Software Function	**Degree of importance**
Project time-line	18%
Task progression index	15%
Project main information	15%
Resource utilization rate	15%
Historic Budget	10%
Chat-Dialogue notification	9%
Program broad vision	7%
Priority of tasks	7%
KM sharing and best practices	2%
Document storage	1%

Table 1 PM support systems acceptability criteria and importance

Acceptability criteria	**Degree of importance**
Affordability: seize time, visual, learning curve	17,8
Flexibility: adaptability to the project / user autonomy	14,7
Structured: tree structure / adapted notation / research engine	14,5
Friendly: fun/simple / nice/ pretty	13,9
Local Server	10,6
Scalability: follow the user practices	9,9
Interoperability: different supports synchronization	9,8
Price	8,8
Total	100,0

Table 2 PM support systems acceptability criteria and importance

Stage 3: Potential solutions evaluation

A systematic research of the available tools was carried out (commercial and open source tools were included). Using a search engine and project management software cross-evaluation websites, as a result a set of one hundred candidate solutions has been established.

An iterative selection process was decided. First, a global evaluation of the set of solutions was made, taking into account the two previous stages of the methodology: First, the firm technological competencies and organizational culture, and second, the software requirements in terms of functionality and user acceptability. A selected group of 30 candidate solutions was then retained.

Each software solution in the 30 shortlist have been deeper explored, and evaluated in the two groups of functions and acceptability criteria. A mark between 0 and 100 has been assigned to each criterion. For quantifiable criteria and subjective ones the notation the notation is relative to 100 to the best solution and 0 to the worst. From this list, 7 solutions were selected (the consensus was, these having a score above 150/200).

Then a demo live event was organized were editors of the selected solutions to present to the team the principles and advantages of each one. As in this particular case the proposed solutions are proposed on-online, demos were easy to be scheduled with providers. Most of the concerned users attend at least one of the demos. Discussions on behalf the needs and work practices of the companies to insure the project throughput and outcomes were at the same time held.

With the live demo the non-correspondence of 3 solutions have clearly appeared, whereas two solutions emerge above the other one clearly. These two solutions were put in beta test phase. To stress them face to numerous data and multiple projects. At the end of this test situation, one of the solutions revealed itself to better fit the firm features and needs. With a last pair comparison of the two solutions on each functionality and usage facilities, a choice for a unique solution had been made.

Stage 4: solution deployment

Once been tested, the selected solution has to be parameterized to the actual company situation and prepare at the same time, few improvements in the process. A workshop with the program manager allows us to propose an ideal project manager structuration of the tool. First, future key users of the solution, it’s around his needs, the solution structure is established. Then, with all the managers constituted in a beta deployment team, a workshop collectively established a new way of working for a manager trough this tool.

In this company, it’s important to first focus on the manager, they have their own work of work pacification to do through this platform. Frist the main change appear of this manager, then the full team implication, will not change many things for them it will only automate the collect of the information. Furthermore, for the team been in contact with the solution without being directly impacted on their daily work, favoring their acceptance of the solution.

After two weeks of restricted to top management, deployment of the solution, with an individual formation of all teammates, the solution is boarder deployed. The personalized and complete presentation of the solution is linked with the password access deliverance.

The user had initially a limited access with only two boards. Boards where he have to feed. Thus, this low dispersion with only two boards, results are more perceptible and the user avoids to getting lost and fear in a too board solution. The solution will become boarder and boarder according to the team need and request. In this field, managers and user ride up some needs becoming configuration challenge for the Integrator. During one month more than 30 solicitation can be enumerated, a board of the configuration challenge to be raised is created

and with more than 50 software solution request, most of the challenged were raised up. All of them get an answer about the feasibility in the 3days.
These good reactivity, and engagement of the team make them feel supported. On a feedback interview, more than 85% of the user are satisfied with the solution to a first level, and his deployment and are volunteering to be more active into the project management and action planning. This second part of the action and deliverable planning will be the hear level 2 deployment.

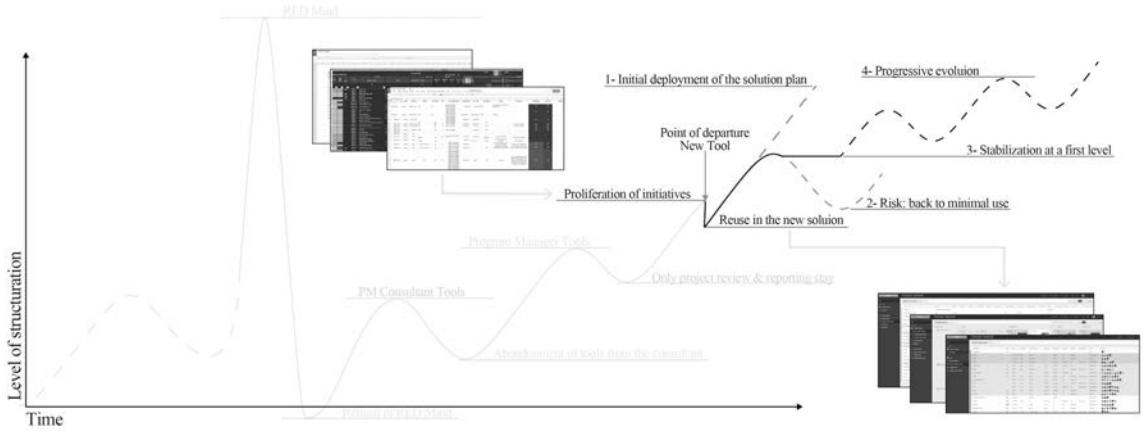

Figure 2 A maturity level process for technology deployment

The company with everyone implication was satisfied with the first good results, forgotten project came back into the radar of project management, the number of information gathers on each project is up from 24 to 43 and projects information's rates fast grow up to 73%.
All these good results are published in a virtual hall of fame into the firm's intranet. In this hall of fame, spontaneous initiatives around the solution are notified recognized and rewarded. The level of deployment to achieve is also notified by using the same communication channel.
A user guide is also written, in twice week version. Display on the intranet, it allows a progressive affectation of the solution. Saved in a complete guide into the intranet, it would be an element central for new collaborators of the company.

Lessons learned:

After the project deployment experience some points should be underlined:

- The proposed methodology was applied with the support of the university and a full-time graduate student to support the methodological tools. An external person is needed as the deployment of the project needs it-self, availability of resources to be conveniently implemented. This could be disturbing for the firm team, as in a growing period this external person could be perceived as a non-added value resource (non in direct contact with the customers).

- Methodological clarity, transparency and rigor improves the implication of future users along the process, also ease the acceptance of the solution by making the decision as the team makes part of the decision process. The organization and every team member, can feel taken a rational and consensual choice.
- The evaluation process (stages 2 and 3) provides a good opportunity to enhance the capabilities of the firm, as the team members share difficulties, tips and routines during the discussion sections. Furthermore, it allows the group to define a standard process that must be validated and share with everyone.
- As processes (project management practices, in this case) start to become formalized for the first time, there is a temptation of improve and simplify it. From our experience formalization and improvement are actions with different dynamics and lead times. Pretending to apply it simultaneously could lead to a counterproductive effect due to a higher complexity.

5. Conclusions

Today, the ability to implement and appropriate new technologies is a key success factor for an industrial sector to stay competitive. This ability is even more important for fast growing SMEs to insure their survival and competitiveness. As a consequence, efficient management of technology transfer projects of organizational support technologies became a priority for entrepreneurs.

Thanks to a constructivist approach, the literature review and past project experiences, this paper makes two main contributions. It proposes a four-stage methodology in order to improve the chances TT project's success. Furthermore, a real case study of HGF in France is used to illustrate the proposed methodology.

A limit of the present case is that it represents a six-month period of joint work with the company in 2015. A longer period of analysis is needed to conclude on the integration of the technologies and competencies on the firm daily routines.

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