

Applying Innovation Strategy Implementation In Facilitation of Front End Innovation

An action-oriented case study

by

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Abstract Front end innovation (FEI) represents the first building blocks of product development, but is often regarded as a weak link in innovation literature. Various theorists emphasize that a firm's innovation can benefit substantially by improving the front end of innovation (Reinertsen, 1999, Steven & Burly, 2003, and Vernorn et al., 2008), and that innovation strategies play a central role in optimization of innovation (Clark & Wheelwright, 1995; Cottam et al., 2001; Morgan & Berthon, 2008). Innovation strategies are suggested in literature (e.g. Page, 1993; Oke, 2002; Adams et al., 2006; Igartua, 2010) as a facilitator of innovation and may therefore also be targeted at supporting FEI. The pharmaceutical industry has experienced a worldwide decline in the number of applications for new molecular entities to regulatory agencies since 1997 and increasing R&D expenditure. Therefore high pressures are put on pharmaceutical research and FEI to produce more valid candidates and faster for drug development. This paper explores in action how pharmaceutical front end innovation can be actively supported through the development and implementation of an innovation strategy.

Keywords *Front End Innovation, Innovation management, Innovation strategy, Pharmaceutical innovation, Action research*

Introduction

During the last decades extensive research has been conducted in the field of New Product Development NPD, and a growing body of research suggests that a firm should proactively manage and optimize the FEI to boost the chances of developing successful innovations (Reinertsen, 1999; Boeddrich, 2004). A company's ability to stimulate innovation is highly dependent on the stock of potential ideas, which are available to feed the NPD process (Brennan & Dooley, 2005). Or as Stevens and Burly (2003: 17) state: "...the first few plays of the game determine the outcome". This emphasizes the importance of an effective process for idea generation and development also referred to as the front end on innovation (FEI). Existing findings indicate the front end process as having the largest potential for improving innovation at the least effort (Nobelius & Trygg, 2002; Perttula, 2004; Williams, 2007; Backman, 2007). The usage of innovation strategies in managing innovation is becoming increasingly common (Morgan & Berthon, 2008) and this study will therefore examine how an innovation strategy can be developed and implemented in targeting active support of front end innovation.

The pharmaceutical industry has been facing decreasing product launches and is unique in terms of FEI. For one, pharmaceutical innovation is science-driven and not customer-driven. The pharmaceutical FEI or discovery process lasts up to five years and the entire R&D process often reaches up to ten-twelve years. In addition pharmaceutical R&D is highly controlled and regulated by external authorities, such as The American Food and Drug Administration (FDA), which require comprehensive documentation, if the drug should

potentially be launched on the American market. The pharmaceutical industry therefore faces serious challenges in relations to the performance of their FEI and as a consequence of their unique characteristics.

Thus, the aim of this article is to examine how pharmaceutical FEI may be supported through the development and implementation of an innovation strategy. As such the research question of this paper is: *“How can pharmaceutical front end innovation actively be supported through the development and implementation of innovation strategies?”* The purpose of posing this particular question is to study and examine the process and derived effects of working with an innovation strategy in facilitation of FEI. How does innovation strategy formulation influence FEI and in what way should the innovations strategy process be designed to enhance the positive effects on FEI activity? These are some of the sub questions to be addressed in understanding the impact of innovation strategies on FEI.

Theoretical background

In this section a theoretical understanding of the concepts of FEI, pharmaceutical innovation and innovation strategies are presented. Based on this, an initial framework is created, through which the empirical data is later analysed.

Front End Innovation

Several studies highlight the importance of the FEI on the success of a company's innovation (e.g. Booz, Allen, Hamilton, 1982; Dwyer and Mellor, 1991; Atuahene-Gima, 1995; Shenhar et al., 2002; Reid & Brentani, 2004; Verworn et al., 2008). In a longitudinal study of eight radical innovation projects, Rice et al. (2001) pointed out the fuzzy front end as one of the most challenging parts of the lifecycle. Various authors also address the FEI as the key to innovation success. E.g. Cooper and Kleinschmidt (1994: 26) found that *“the greatest differences between winners and losers were found in the quality of pre-development activities”*. Reid and Brentani (2004: 170) even call the front end, *“the root of success”* for firms involved with discontinuous product innovation. Factors like quality and costs and which projects to execute are determined in the front end of the innovation process. Hence, the effects of the FEI and the decisions made in the front end have high impact on the whole innovation process (Verganti, 1999).

No innovation is possible without the creative processes, which mark the front end of the process and include the identification of important problems and opportunities, information gathering, generation of new ideas and exploration of the validity of those ideas (Amabile et al., 1996; Dyck & Allen, 2006). The FEI is defined by those activities that come before the more formal and well-structured NPD process (Koen, et. al., 2001), which Cooper (1988) originally distinguished as four phases consisting: the generation of an idea, initial screening, preliminary evaluation, and concept evaluation. The author has selected a definition of front end innovation that can be applied in pharma and in most other industries: *“Front end innovation is the period between when an opportunity is first considered and when an idea is judged ready for development (Kim & Wilemon, 2002: 269)”*.

Pharmaceutical innovation

Pharmaceutical FEI or referred to as the research and drug discovery process lasts up to five years and entails costs of \$50 million on average. It is highly science driven and regulated by external authorities like, The American Food and Drug Administration (FDA), which requires a well-structured process easy to document and verify down to the smallest detail. Pharmaceutical innovation is facing developments in technological platforms, business models and customer requirements, which challenge the need for exploration and radical FEI and NPD and ways to support this development.

Since the breakthrough of the first blockbuster drugs in the mid-1980s the dominant business model for pharmaceutical innovation has been the vertical integration of the whole supply chain: controlling and managing production from the lab to the factory gate in an attempt to capture maximum value through broad-spectrum blockbuster therapies. However, the assumptions behind this business model are now being revisited as a result of both upstream and downstream challenges. In-house research in FEI is being supplemented by alliances with academia, biotech companies and start-ups, as are different strategies to develop more creative and innovative research management structures and cultures. These alliances not only generate access to novel drug discovery platforms in the pharmaceutical FEI, but also supplement the development portfolio that is generated internally (PWC, 2007).

Pharmaceutical innovation is characterized by being under pressure to innovate and to be cost-effective at the same time. As drug development becomes more risky and costly, (Schmid & Smith, 2005; Herson, 2005) the FEI represented by the research/discovery departments of pharmaceutical companies are increasingly being compelled to provide strong drug candidates for efficient drug development and quick market launches. This challenges the organization and structures of pharmaceutical FEI emphasizing the need to support and enable the front end activities in a targeted manner. In an industry where a newly discovered therapeutic agent with blockbuster potential still faces more than a 90% change of failure during the development phase (Duyck, 2003) and knowing that the fully loaded cost for the development of the agent amount to about one billion dollars (Pacl et al., 2004) it becomes clear that enhancing the 'predictability' of the discovery process/FEI ought to be an immediate priority area of investment (Duyck, 2003).

Innovation strategy

The positive effects on innovation from the applications of innovation strategies are documented in literature by numerous researchers (e.g. Clark & Wheelwright, 1995; Lynn et al., 1998; Englund & Graham, 1999; Cottam et al., 2001; Hüsigg & Kohn, 2003; Alves, 2005; Morgan & Berthon, 2008). Cottam et al. (2001) stress that in order to maximize the benefits of previous innovations, innovative activities must be given a strategic direction. An explicit innovation strategy is addressed as a success factor for several reasons. First, it provides a guideline for dealing with strategic issues, such as selecting the markets to enter and the skills to develop (Lester, 1998).

Second, strategically planned projects enable the firm to take advantage of synergy between parallel innovation projects (Adams et al, 2006). Third, learning-by-doing can materialise, enabling the firm to reap benefits of previously successful innovations along with firm-specific skills that emanate from them (Rothwell, 1992). Fourth, working on incremental and radical innovations, the innovation strategy allows for financing the latter with the bread-and-butter profits generated by the former. This preserves the firm from relying solely on product differentiation (Zirger, 1997). Finally, portfolio planning adds directly to R&D skills, R&D

teams involved in several projects simultaneously are observed to be more successful than R&D teams, which are not (Kleinschmidt & Cooper, 1995).

The organisational strategy reflects the priorities and values of the organisation, which consequently has an impact on creativity and innovation (Martins & Terblanche, 2003), but an organisational strategy is not enough to support innovation, an explicit innovation strategy is required (Morgan & Berthon, 2008). An innovation strategy should define the aims and objectives of the innovation efforts in relation to the organisation's overall strategy. It should specify market niches as targets to focus on and formalise the necessary structures for implementation. An innovation strategy should also focus and integrate team effort and permit delegation and support innovation through concrete activities (Cooper & Kleinschmidt, 1996; Cooper, 1999, Igartua et al., 2010).

Methodology

The action research methodology has been selected in this study to provide real-life knowledge of the actual process and experienced effect of enhancing FEI in practice through the development and integration of an innovation strategy. Action research is based on a collaborative problem-solving relationship between the researcher and client, which aims at both solving a problem and generating new knowledge (Coghlan & Brannick, 2001). The AR¹ understanding and approach utilised in this article is that of Hart (1996: 454), who explains action research as: *“problem focused, context specific and participative...involving a change intervention geared to improvement and a process based on a continuous interaction between research, action, reflection and evaluation”*.

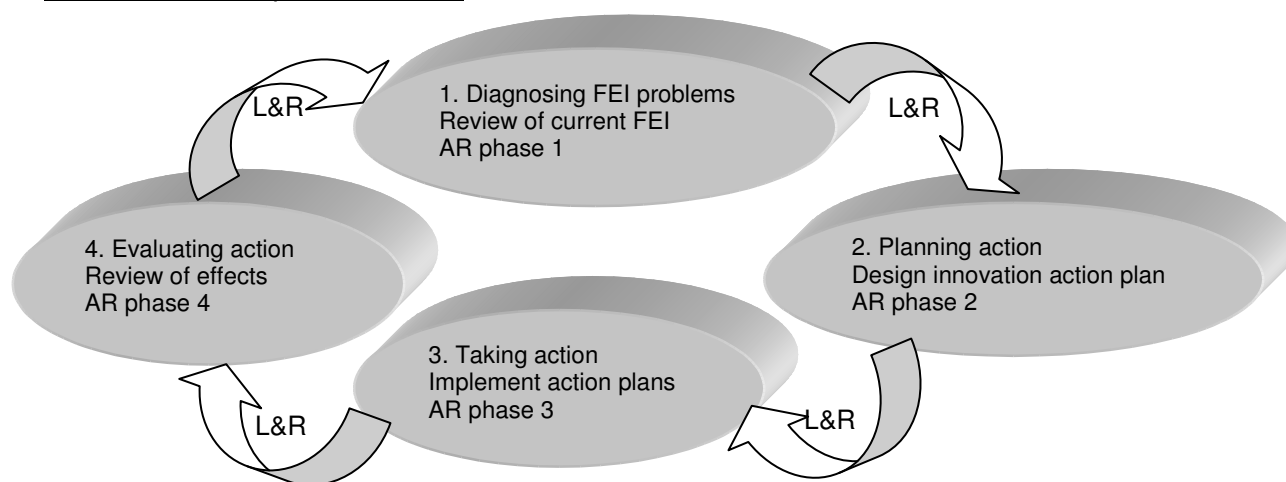
The AR study of this article is problem focused (supporting FEI in action), context specific (within a specific pharmaceutical company) and participative, but in various degrees in the different intervention activities. The author of the article carry the role of the facilitator and as a sparring partner, which is the reason why the applied methodology is described as *“action oriented”*, although AR is the term used throughout the article. In undertaking action research, the emphasis is on research leading to change. It is a continuous and iterative cyclical process, involving four parts: research and development; intellectual inquiry and practical improvement; reflection; and action (Altrichter et al., 2002). After actions have taken place, the researcher's role is to investigate the 'patterns of change' and the impact of the learning process (Alexander et al., 2003).

The article is written on the basis of a longitudinal PhD study on how to support pharmaceutical FEI in theory and practice, which was conducted within H. Lundbeck A/S. This company was selected as it represents the general challenges of many established medium to large sized pharmaceutical companies' in staying innovation and maintaining the necessary focus and support of efficient and radical FEI. H. Lundbeck is a Danish based pharmaceutical company with research facilities placed in New Jersey and Valby, Copenhagen. They were founded in 1915 and today they are an established player on the market for Central Nervous system CNS medications with focus on treatments for depression, schizophrenia, Alzheimer's disease, Parkinson's disease etc. The empirical focus and the focus of the data collection address the research division of H. Lundbeck, which represent FEI and the FEI process of the company.

¹ Action research and the action oriented approach applied in this study will be referred to as AR throughout the article.

The practical process of carrying out the AR study of this article is captured in the action research process model below, which is inspired by Moss et al. (2007). The model is applied as a guide and overview of the process in exploring the article's research question. The AR process model depicts the four main activities: diagnosing, planning, taking action and evaluating, involved in carrying out the AR study and which are explained in detail below. The arrows between the four activities including the text, "L&R" represent the learning and reflections obtained during and after each activity.

Model 1: The AR process model



Inspired by Moss (2007: 297)

AR phase 1: Diagnosing FEI problems of the case company

The first group of activities constitutes the diagnosis of the problem areas to address in the action study of the case company. Observations of the company's FEI activity and current FEI process were monitored through observations. The derived findings were applied in formulating an interview guide to be utilised in identification of the key issues of FEI within the case company. Eighty qualitative individual semi-structured interview sessions were conducted among 27 strategic employees (CEO, divisional directors), 27 tactical employees (department managers, senior scientists and project managers) and 26 operational employees (lab scientists in research), representing the employees responsible for FEI in the company. The derived data were categorised and analysed through the use of the contemporary method, meaning categorisation (Kvale & Brinkmann, 2008: 203), where similar statements were grouped in categories of the key development areas as presented by the informants.

AR phase 2: Planning action through innovation strategy workshops

The second group of activities included the planning activities, which constituted a two-day management workshop in which the top management group discussed and prioritised the identified FEI problems identified through observations and the meaning categories derived from the individual interviews performed in AR phase 1. This process was facilitated by the AR researcher. The development areas of the innovation strategy were identified and categorised in the following six focus areas: 1) Innovation culture, 2) Communication, 3) Innovation employees, 4) Collaboration, 5) Processes and 6) Knowledge of customers. These focus areas were integrated through the development of a corporate innovation

strategy and related activities to be carried out by the case company. The corporate innovation strategy was presented on a joint innovation workshop across the research organisation, where feedback was collected and included and a revised corporate innovation strategy was mailed out to each division after the workshop. Hereafter each of the seven divisional managers was requested to plan and carry out their own workshops with the employees of their respective divisions in identification of the concrete activities to be carried out in support of FEI in the specific division and department.

AR phase 3: Taking action through implementation of the innovation strategy

The third group of activities included taking actions and represented the implementation of the corporate innovation strategy and integration of the divisional innovation action plans throughout the research organisation. The implementation of the divisional innovation action plans in practice were carried out by the divisions themselves, but observed by the AR researcher². The participative role in this phase was therefore limited. The reason here fore was practical, as it was not feasible to participate in the implementation processes of all seven divisions. Furthermore, it was decided by top management that the divisions should carry out this process themselves to ensure commitment, empowerment and ownership. Thus, the AR researcher monitored the implementation process as an observer and assisted in providing inspiration and knowledge when requested in some of the implementation activities performed by the divisions.

AR phase 4: Evaluating actions and the obtained effects

The fourth group of activities, evaluation of the AR study, constitutes a collection and analysis of the monitored quantitative and qualitative effects of the AR study. The evaluation data were collected through interviews sessions with representatives of top management and the seven divisions. The evaluation of the AR study and the learning and reflections made during the fourth phase put emphasis on the need for a continuous development process, which included activities for next steps. A so-called “Cross Inno team” with management and employee representatives of all seven divisions was established and given the responsibility and resources to carry on the continuous development activities in support of corporate and divisional FEI after the innovation strategy implementation process.

Findings

The findings from the first step of the AR process, *Diagnosing FEI problems of the case company*, made it clear that different problem areas in facilitating FEI are considered central by the strategic, tactical and operational level of the organisation, represented by top management, middle management & senior scientists and lab technicians. This finding may not be surprising, but as many strategic planning processes are traditionally carried out by top management with little or no involvement of employees; this finding stresses that not only management should define the problem areas to be addressed in an innovation strategy, but also employees on the operational and tactical level ought to be included and questioned in the problem identification process. The diagnosed FEI problems of the case company constituted eleven meaning categories, which were suggested by the informants Below, the meaning categories are presented in the order of accumulated attention/priority provided each category by the eight informants:

² The AR researcher resembles the author of this paper.

1. Explorative team culture tolerant of failure
2. Efficient cross functional and cross disciplinary knowledge sharing & collaboration
3. Empowerment of employees to learn and explore
4. Innovation leadership motivating discussions of ideas
5. Clear communication of direction, status and goals
6. An innovation strategy & objectives guiding not dictating innovation
7. Targeted knowledge sharing and collaboration with external partners
8. Organisational structures supporting learning & knowledge sharing
9. FEI as a flexible learning process
10. Aligned, trained and easy-to-use IT systems and networks
11. Measures and measurement of innovation

Informants from each organisational level provided very insightful information on how FEI is best supported within the specific employee group. The operational level of the pharmaceutical FEI/the research organisation is represented by the lab technicians, who carry out the majority of the lab work and generate all the fundamental test data necessary to the scientists and the scientific analysis of the compounds being evaluated. The operational level specifically emphasised the following four factor categories in the given order:

10. Aligned, trained and easy-to-use IT systems and networks,
2. Efficient cross functional and cross disciplinary knowledge sharing & collaboration,
3. Empowerment of employees to learn and explore,
5. Clear communication of direction, status and goals, and

These factors were stated as the key elements in support of FEI and to be included in the innovation strategy. All scientific data and lab work has to be digitalised and stored through it-based database systems. The efficiency and quality of it-systems and networks therefore strongly influence the optimal data storing and retrieval opportunities of operational employees in the FEI and thus constituted a central development area to address in the innovation strategy.

Informants on the tactical level counted middle management, project managers and scientists, who were actively involved in the daily research and FEI processes, and had the daily or some management responsibilities. As this group counted the majority of the employees in the research division of the case company, interest as to how FEI was supported optimally in this group was closely followed by the management group. The findings from this informant group particularly emphasised the following four factor categories in the given order:

1. Explorative team culture tolerant of failure,
2. Efficient cross functional and cross disciplinary knowledge sharing & collaboration,
3. Empowerment of employees to learn and explore and
4. Innovation leadership motivating discussions of ideas.

These findings stressed the need for management to enhance their leadership skills and in providing room for a more explorative climate in the research/FEI process. In addition an identified lack of training opportunities and HRM were emphasised as further development area to address in the development of the innovation strategy.

The strategic informants represented the top management level of the research/FEI organisation and counted divisional directors and the Vice presidents of Research. The development areas stressed by this informant group included the following four factor categories listed in the given order:

2. Efficient cross functional and cross disciplinary knowledge sharing & collaboration,

1. Explorative team culture tolerant of failure,
6. An innovation strategy & objectives guiding not dictating innovation,
7. Targeted knowledge sharing and collaboration with external partners and
11. Measures and measurement of innovation

The data analysis did not reveal any differences in the emphasis of factors made by male or female informants. Yet the factors stressed by young employees of low experience and among employees of high experience did reveal an overweight in emphasis on training/HRM and mentoring among the previous group. This finding is not surprising as new employees of less experience require training and development to participate effectively in the research/FEI process. Yet, this finding was the main reason why a new and improved employee training and mentoring program was established and included in the innovation strategy.

The learnings from this problem identification phase underlined the need and the positive effects of questioning employees on all organisational levels on how to support FEI, as the development activities identified in the innovation strategy targeted the specific problem areas experienced by the employees from all parts and levels of the FEI process. The actual process received very positive feedback from the informants as well as the rest of the organisation, and particularly by the operational level, as they were not used to being involved in strategic processes. One lab technician stated: *"We (lab technician) are normally never asked in these strategic processes, as we don't operate on the management level... I don't know how much we can benefit the process, but it feels good to be involved, as we are also a part of the company"*. A middle manager expressed her experience of the process through this statement: *"Inviting different employee groups to participate with their knowledge and insights in mapping the key problem areas to address in support of research/FEI was brilliant, but the side effects are even more impressive, as all the departments are buzzing about innovation... employees are talking about what innovation is in their jobs and how they can enhance it on a daily basis."*

A key learning from the process was that the problem identification phase of strategy formulation can stimulate talks of innovation, ownership and involvement across the organisation, if employees are included in the problem identification analysis of the strategy formulation process.

The second phase of the AR process, *Planning action through innovation strategy workshops*, constituted an intense two-day management workshop, which received positive feedback by all the top management participants. The fact that the entire top management group of the research division was assembled for two whole days with the sole purpose of supporting (front end) innovation was a new experience for all. One of the top managers stated: *"We should actually do this every year, as we never have time to meet all of us and get to the bottom of things"*. Another effect was that the management group reached a common agreement of how to define innovation within the organization and what types of innovation to support in which ways. This debate resulted in the formulation of an innovation vision, an innovation mission statement and an innovation strategy plan to guide not just the management group but all of the company in supporting FEI and pursuing innovation continuously.

A presentation of the outline for the innovation strategy plan was carried out at a joint innovation workshop, where middle management and employee representatives of all divisions and departments were included in discussing and commenting on the strategy outline. Several inputs were provided and later integrated in the further development of the strategy. The debate was so extensive that the time lines for the agenda were extended. A

key learning from this workshop revealed that the middle management should have been invited earlier into the planning process to ensure ownership and efficient integration of the strategy. Most of the discussions and questions from the joint innovation workshop would have been already dealt with, if this informant group had participated in the strategy formulation process, possibly on day two as suggested by one of the top managers. It later became apparent from the evaluation interviews, that many of informants from middle management had viewed the workshop as a presentation of a final strategy and not as an outline for discussion and further development, as was intended by top management.

After the joint workshop each division was required in collaboration with the divisional employees, to develop a divisional action plan explaining how the individual division would target and work with the specific development areas in supporting research/FEI in their own divisions and departments. These action plans were later handed in to management before a given deadline. The individual action plan development processes of the divisions varied. The divisions were offered assistance in facilitating the action planning process by the action researcher, where the seven divisions applied the action research in different ways as facilitator and for sparring.

Observations from this process revealed divergent results from the divisional processes. On the positive side, the divisions' autonomy in designing and completing the workshops allowed for creativity and a tailored approach that suited the specific characteristics and subculture of each division. Furthermore the responsibility of the divisions in carrying out the process themselves enhanced the level of involvement and ownership among the managers and employees. However, it became evident during the process that the employee involvement depended on the management style and the existing autonomy and culture in the division. On the negative side, the variations in approaches made it difficult to compare and share experiences among the divisions. The results of the workshops also varied in terms of the employees' involvement in the action plans and the level of specificity of the activities in the action plan. A middle manager suggested during the evaluation interviews, that a common tool box should have been provided, particularly in assisting the managers who were not familiar with action planning workshops. Thus, the learning from this process indicated the need for a common workshop process guideline and tools in ensuring a 'minimum' quality level of the process.

It became apparent that the enthusiasm and the process- and communication skills of the division's manager had a clear effect of the quantity and quality of the innovation enhancing activities planned and successfully set in motion by the divisional employees. Some divisions could later present impressive results and developments, whereas others could merely show few and incremental adjustments to the existing ways of supporting ideation and FEI in the division. The divisions with the most impressive results were generally led by charismatic and enthusiastic leaders, who had involved the employees actively in the innovation plan development. A key learning from this process therefore suggests that facilitation of FEI is heavily dependent on management's leadership skills and ability to empower employees in the strategy formation process. Some of these process skills and leadership capabilities and should potentially have been trained prior to the action planning process, whereas others are dependent on personal skills, which are difficult and if not impossible to train.

A divisional manager's statement addressed the same observation: *"This company-wide-process of designing innovation action plans has made it painfully obvious to me how different management styles affect the results of such a process... I personally observed how the more process-skilled and enthusiastic managers got their employees actively involved and motivated, whereas the managers, who were not accustomed to these joint planning processes, had a really hard time during this task"*.

The third phase of the AR study, *Taking action through implementation of the innovation strategy*, constituted the implementation of the corporate innovation strategy and the integration of the divisional action plans. This process was carried out by the top management and the divisions themselves, while monitored by the action researcher. Management had specifically requested that the divisions took charge of their own processes, although the action researcher was available for sparring and ideas in carrying out the actions. Interestingly enough none of the divisions requested help, some questions were posed and inputs for solutions were provided, but all seven divisions carried out the action plan implementations themselves. In the corporate innovation strategy, the top management group had lined up a number of specific activities to be implemented corporately across the divisions, which required the action researcher's participant.

Among the corporate initiatives an Innovation Team was formed, which consisted of divisional managers and employee representatives, whom were given the responsibility of carrying on the continuous development process after the innovation strategy implementation. Furthermore HR related initiatives were set in motion through an upgrade of the HR department and the development of a leadership academy with specific courses and activities targeting training of innovation management and other innovative capabilities among different employee groups.

In addition, several process and systems optimisations were carried out. Several of these adjustments and enhancements had been discussed previously and had been on the way for some time, but the innovation strategy process somehow provided the 'umbrella' and the right opportunity to capture and finalise these improvements. As one management informant stated: "*The innovation strategy has in a way provided the forum and the opportunity to address several organisational and process related inconveniences at once, that we have talked about for some time now*". A key learning is therefore, that innovation strategy implementation processes may enhance the FEI through the spin off activities that alter the general condition for FEI within and across the organisation.

The content of the individual divisional action plans differed in relations to which specific internal issues or barriers of FEI needed attendance. Yet, all seven divisional action plans shared activities concerning enhancement of innovation culture, improved cross-functional collaboration and more idea presentations and joint discussions of ideas. The speed, efficiency and quality of implementing the actual action plans varied among the seven divisions. Once again the divisions, which had worked diligently with the planning process and had actively involved the employees, proved more successful in both carrying out all activities within the deadlines and in actually generating measurable results and a positive spin of innovative activities (e.g. idea forums, new cross-functional collaborations, innovation overview boards illustrating the progress of FEI project and new suggestions schemes etc.).

Consequently, the divisions who had rushed through the process without emphasis on employee involvement and continuous focus on the action plan integration did not meet their deadlines and did not see all their planned activities through. A research scientist captured the essence of this observation through his statement: "*This process is not about implementing a plan, but about integrating a new mindset and an enhanced focus on all the opportunities for innovation and new ideas that we are presented with on a daily basis...I think some managers have failed to see the true objective of this process and have therefore little to show for at the end of this process*". This observation again stresses the necessity of providing tools, guidelines and management training as a minimum, prior to such strategy implementation processes, if positive and measurable effects on FEI are to be ensured.

The fourth phase of this action study, *Evaluating actions and the obtained effects*, included the evaluation of the process and the effects as well as an identification of learnings obtained after the planned actions had been carried out. Data collections were carried out through the use of both individual and focus group interviews with 1-3 representatives of each of the seven divisions. The interviews addressed expectations prior to the process, learnings from the process and qualitative and quantitative effects and results attained from the facilitation of FEI/research through the innovation action plan implementation.

A number of quantitative and qualitative effects and results were identified by the informants. The most significant effects of the innovation strategy implementation process were the measurable increase in the quantity and quality of ideas presented, and the improved collection and enhanced level of discussions of ideas across the organisation and from all organisational levels. The effect was considered the most important by all informants, as the purpose of the innovation strategy implementation process was to improve the number and quality of ideas entering and being matured through the FEI process of the company. Several activities had been put in motion and had successfully improved existing research/FEI processes. Furthermore specific process innovations were set in motion to enhance the efficiency and quality of the FEI process (e.g. a leaner and more explorative patenting process).

In addition the improved awareness of front end innovation within the company and the actual opportunities of FEI integrated in the daily working routines were mentioned as key results from the process. Through the innovation strategy implementation process, the employees had also improved their knowledge of the company's vision, mission and strategy for innovation, as these were presented and discussed on several occasions, and as management integrated these elements in their presentations, almost as a mantra of FEI and as a way to keep focus. Cross company communication, knowledge sharing and storytelling on FEI/new research projects had improved considerably and concrete activities were carried out to improve the introduction of new employees to the FEI/research process and – organisation, to ensure a more effective inclusion of new employees in innovative activities.

A positive side effect of the increased cross-company dialogue and collaboration was the improved use and re-distribution of resources across the divisions carrying out FEI. Previously resources had been allocated to each division, and if they were not used by the division, the division could 'save' the resources for other later projects, even though other divisions were in need for more resources for current projects at the same time. The increased knowledge sharing across the divisions made the planning of resources a lot easier and the allocations more accurate and flexible.

An interesting and surprising finding and result was a visible increase in the collaboration with and use of lab technicians in the FEI/research process, which most of the informants had witnessed. Before the innovation strategy process the lab technicians had primarily been applied as resources for more hands-on assignments, whereas they were now included and applied in new ways and more effectively in collaboration with the scientists in the FEI process.

One of the operational informants, a lab technician stated that: *"This process has really helped improve our daily working processes and has also been fruitful to the collaboration between us (the lab technicians) and the scientists and project managers... as we have taken the time together to adjust and correct the inefficiencies in our daily processes and joint work assignments"*. A project manager stressed the following effect: *"We now discuss ideas more openly and give each other more structured feedback... we have even initiated a monthly idea meeting... these discussions of ideas and project progress are central in continuous*

validation of our (research) work and in stimulating the curiosity that is needed to be innovative on a daily basis”.

Discussion

Performing case studies over longer periods of time entail a common issue related to the challenges of studying a moving target. Time affects the study at hand through the many internal and external factors influencing the object of study. The issue of time is particularly pervasive in action oriented studies, as the influences of time and external factors on the obtained effects of the actions are difficult to identify and isolate. Isolation is not an option as we are dealing with reality and a study of reality.

Abrupt events or occurrences may change behaviors and have an effect on the outcome and your findings as a researcher. This issue was witnessed in practice during the AR study of the US division, which underwent a radical organisational change and an increase in employee turn over as result of this. These changes altered the focus and motivation of the participants, which further influenced the initiatives and the results of the planned intervention activities. Furthermore as the pharmaceutical FEI/research process lasts up to five years and the final products are not launched until five to seven from the idea is brought to the table. It was therefore not possible to conclude from this AR-study if the FEI supporting activities of the innovation strategy had actually presented financial results through more innovative products and improved product sales over time.

The AR-study revealed that the process of starting with an identification of problem areas made the innovation strategy more targeted and relevant for the employees, as they had helped identify and map the problem areas and improvement needs of their divisions. To avoid that the top management group only identify the challenges that they experience and view from a strategic viewpoint, data collection through surveys or interviews should be carried out among employees of all organisational levels in identification of the specific development areas and barriers to be targeted in the innovation strategy. The innovation management literature and innovation strategy research does not emphasise this point, and this finding of the study may therefore be viewed as a contribution to the existing literature.

It also became apparent during the joint innovation workshop that the development of the outline for the corporate innovation strategy should have involved middle management, although the innovation strategy was built on the input, suggestions and findings from the eighty interviews with operational, tactical and strategic personnel. Innovation strategies need ambassadors and not just among top management. Middle management apparently carries a central role in selling in the innovation strategy to the rest of the organisation and to the employees on the floor.

The top management group had decided from the start that the divisions should be free to determine their own processes and goals. The reason for not setting up fixed goals was to allow for latitude in how the managers went about planning and taking actions. Yet the lack of directives and communication of what (at a minimum) was expected from the divisions had the opposite effect than intended. The latitude made the managers nervous and suspicious, as if they thought top management had a second agenda, which was not the case at all. Hence a better approach would have been to discuss possible goals in guiding the division's action planning and implementation process. Another learning and suggestion for improvement would be to present an overall process and generic activities to be performed

and then let the managers decide for the rest, while providing an overall frame for the planning and implementation process.

In the later divisional action planning process the different contents and emphasis of the divisions underlined the importance of tailoring the activities according to the specific characteristics of the group of people you want to address within each division. Hence a corporate innovation strategy should only represent a platform for discussions, where the identification of specific divisional activities in facilitation of FEI should be carried out by the divisions themselves. More and more research (Martins & Terblanche, 2003; Morgan & Berthon, 2008) address the need for integrating innovation strategies in facilitation of actual innovative activity and the conclusions of this study confirm these findings.

The implementation process of the corporate innovation strategy and the divisional action plans indicate that the continuous communication of progress, results and learning between the divisions and top management is also an essential element in enhancing joint results, as knowledge and best practices are shared between the divisions. Hence inviting divisions for joint presentations and discussions of action plans, where the divisions can meet and collaborate on similar activities to enhance cross functional and divisional knowledge sharing and collaboration is critical and should have been provided more often in the action study. Some division arranged for these collaborative arrangements themselves and carried out joint activities with other divisions with challenges similar to their own. Continuously monitoring and storytelling across the organisation also proved critical as a way of keeping focus and in attaining positive effects of the development process.

Another finding from the process, which may not be that surprising, but still central in a strategy implementation study, is that a strategy implementation process is never better than the manager who performs it. In the study it became apparent that the specific leadership and process skills of the individual manager had a direct effect on the success of the process and the evaluated effects. The way to counteract this issue and a suggestion for improvements would be to provide more guidelines, strategy process training and tool boxes and for all managers, as it appeared that the less skilled managers did not readily acknowledge their own weaknesses. Yet, tools and training can only do so much, as personal motivation and leadership skills differ, so variations in results may be expected.

It was also evident in the study that managers act as role models in the innovation strategy process and their enthusiasm affects the behaviors of their employees. Thus, the leaders who encouraged employee ownership, participated actively in development activities and ensured the open dialogue and knowledge sharing of the process and the obtained effects, also had the most passionate employees, who gladly spend extra hours and made time for the innovation activities and the innovative ideas and projects in the daily work. Thus, making sure that all managers involved are motivated, feel committed and understand the concepts and basics of innovation (e.g. the definitions of innovation) is essential. Hence, a joint training program for all managers could potentially have improved the level of commitment, the quality and the results of the innovation action plans.

The overall conclusion of this paper is that it is possible to actively improve a company's FEI through innovation strategy implementation and facilitation of targeted divisional innovation activities that support FEI and the processes, systems and organisation around it. Based on the findings, the discussion and the presented key learnings from this four-phase AR-project the following propositions for effective support of FEI through innovation strategy implementation are suggested:

1. Gather concrete information on the specific areas to improve in support of FEI from employees from all organisational levels and subdivisions, to ensure that the innovation strategy addresses real issues and involves and empowers employees through their practical knowledge of working with FEI on a daily basis.
2. Invite middle management early into the innovation strategy planning process to ensure ownership, involvement and strong advocates for the implementation of the strategy and in active support of the FEI supporting activities within each division.
3. Provide training and tools of how to carry out the process for the managers, who have to design and implement the targeted action plans of the units/divisions. However allow for individualised initiatives that matches the unique subculture and structures of the specific divisions and units.
4. Let the innovation strategy facilitate concrete opportunities and actual forums for cross divisional and cross functional discussions, collaborations and knowledge sharing of FEI – as it apparently is not a lack of interest, but lack of time and opportunity that holds back the daily focus and support of FEI activity.
5. Set up a task force of managers and employee representatives after the strategy implementation process to ensure the continuous development, monitoring, communication and evaluation of FEI activities and effects - and as a way of keeping up steam.

The findings and contributions of this paper present opportunities for future research within the delimitations of the study area. Interesting areas for further research to pursue would be to perform the same study in a different company and industry in gaining an understanding of whether the present findings are generic or industry specific. A cross-industrial study would potentially reveal differences and similarities across different industries in the ways innovation strategies are designed and implemented. Or a similar study to the one carried out could be planned, implemented and evaluated, but including the suggested improvements and where the differences in results could exemplify e.g. the effects early middle management inclusion on the final results of innovation strategy implementation. Furthermore, a longitudinal study of the final effects on product launches and financial results from integrating the FEI enhancing initiatives would reveal the long term effects of implementing innovation strategies on pharmaceutical R&D.