

A Work Project, presented as part of the requirements for the Award of a Masters Degree in Management from the
NOVA – School of Business and Economics.

EDP INOVAÇÃO
KEY PERFORMANCE INDICATORS FOR INNOVATION

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ABSTRACT

The work project follows the CEMS Business Project “Key Performance Indicators for Innovation”, for EDP Innovation. A thorough analysis of the company’s current KPIs and innovation strategy was developed, to assess their accuracy and sustainability in line with EDP-I’s competitors and relevant frameworks for innovation management. As a result of the insights gathered, disruptive KPIs were proposed to add to EDP-I’s Balanced Scorecard, and recommendations were suggested to improve the efficiency of the company’s innovation processes. In this work project, these recommendations are discussed and further elaborated to provide insights on how to better capture the value created.

Keywords:

Key Performance Indicators; Innovation Management; Balanced Score Card; Innovation Culture

1. BRIEF CONTEXT

1.1 EDP Innovation

EDP – Energias de Portugal was founded in 1976 and is one of the major European operators in the energy sector, the largest Portuguese industrial group and the third largest producer of wind energy worldwide. Besides the electricity sector – **generation, distribution and trading** – the Group has also a significant presence in the gas sector of the Iberian Peninsula¹.

EDP's strategic goals for 2014-2017 include continue growing, maintaining financial deleveraging, preserving a low risk business profile, improving efficiency and delivering attractive returns – while being a “*global energy company, a leader in value creation, innovation and sustainability*”, as is stated by their vision statement. The Group believes that in order to achieve this leadership position, **innovation is key** to sustain competitive advantage and support growth; thus, in 2006 **EDP Innovation** (EDP-I) was created, to *deliver innovative solutions that would add value to the different companies* in the Group.

EDP-I uses Innovation in Energy R&D to support growth by optimizing operations and creating new products and services that are crucial for improving existing technologies, and helping explore new ways to find solutions to the future problems that the energy world will face. The company and their Research and Development Policy is centered on furthering the core business of the EDP Group and is directed at the following priority areas: conventional generation, environment and sustainability; distributed generation and renewable energies; electricity distribution; and the energy market and e-value added services. The strategic pillars of EDP-I are **controlled risk, focused growth, and superior efficiency**, and it has defined four key areas as priorities for innovation: **client-focused solutions, smarter grids, cleaner energy and data leap**.

Moreover, EDP Innovation's stakeholders can be divided into four major areas: **market**, where we can find their competition, shareholders and financial entities; **value chain** in the form of their

employees, entrepreneurs and the EDP Group; **democracy**, including public authorities, regulation and international institutions; and finally the **social environment**, where local communities, media and opinion makers and non-governmental organizations are inserted.

1.2 The energy industry

In recent years, there have been a number of significant changes to the nature of the energy/utility industry, both globally and in Portugal. Firstly, **liberalization** and **market integration** have led to a need for superior efficiency, requiring the introduction of more profitable technologies, while globalization has generated greater **industry concentration** through mergers and market internationalization. Economic growth across the developing world and sustainable urbanization in the developed world are leading to an **electricity demand increase**, which has highlighted **environmental concerns** that require the **development** of **cleaner technologies** in order to optimize knowledge managementⁱⁱ. Being one of the most strategic sectors in the world economy, governments, regulators, companies and researches, including EDP-I, are all attempting to develop ‘**best practices**’ in order to optimize the performance of the electricity industry – and they are using innovation to enhance the industry’s competitiveness and performance.

Throughout this project, we have based our analysis in the European utilities industry, having benchmarked the 16 biggest players in the market.

1.3 EDP Innovation’s current situation

EDP Innovation was created with the goal of developing new technologies and services that are core and strategic to EDP, while also delivering profitability into the Group. However, among the four key areas the company is mostly involved, the special projects they develop, and the EDP Ventures division, EDP Innovation was lacking a standardized and ideal method to measure and quantify the actual results of the company’s activities. Thus, the company did not accurately understand how effective it was in achieving the proposed objectives.

Moreover, the team has also identified three main issues that were undermining the capture of value by the activities of this strategic area to its fullest potential: **idea generation, strategy alignment** and **culture**.

1.4 The Business Project challenge

The purpose of this Business Project is twofold. Firstly, the goal is to analyse the current Key Performance Indicators in use by EDP Innovation, and assess their accuracy and sustainability in line with EDP-I's competitors and relevant frameworks for innovation management.

After that, our second goal is to provide EDP Innovation with a standardized and effective method of managing and evaluating the projects currently in their innovation. The team intends to do this by proposing new and disruptive Key Performance Indicators to add to EDP-I's Balanced Scorecard, that accurately reflect the value added impact of the projects.

2. REFLECTION ON THE WORK DONE AND INDIVIDUAL CONTRIBUTION

2.1 Problem definition

EDP Innovation's mission is to develop value-added innovation across the EPD Group. In order to guarantee this and ultimately drive profitability to the group, the company aims to develop new technologies and services that are core and strategic to the EDP Group, through the investment in venture capital and the establishment of different partnerships. However, as a result of the complexity of their activities, EDP Innovation was lacking an ideal method to measure and quantify the actual results of the company's activities, and understand how effective the company was in achieving the proposed objectives.

The methodology used to develop and present solutions to EDP Innovations' problem is described next.

2.2 Methodology

2.2.1 Hypothesis

The main objective of the Business Project was to analyze the current KPIs for EDP Innovation, and assess their sustainability in line with their competitors and other frameworks for innovation management. Following this, we have proposed new disruptive KPIs to be adopted by EDP Innovation, so that the Balanced Scorecard accurately reflects the value added impact of projects currently in the pipeline on the other EDP Business units.

2.2.2 Analysis

- **Innovation in Energy and Utilities**

In order to propose a way for EDP Innovation to correctly reflect the value added impact of their projects, we firstly had to analyse and define the innovation landscape.

The ability of an organization to manage innovation successfully is as much driven by its **ability to handle newness** as by its **ability to make change** happen. Innovation can be measured with metrics relative to the applied changes, as well as the degree of change of the product or service. On one hand, **incremental innovation** is primarily concerned with the improvement of existing products or processes to increase its competitiveness, whereas **radical** or **disruptive innovation** makes major, structural change to the industry and often makes previous products or services in an industry obsolete.ⁱⁱⁱ According to our research and interviews with members of the EDP-I team, EDP is involved heavily in both aspects of **incremental and disruptive innovation**, as represented by projects ranging from the disruptive product WindFloat to the incremental process of Sinergie (*see exhibit 1- Innovation Projects at EDP-I*).

Furthermore, our analysis utilized the IEA (2014) *Good Practice Policy Framework for Energy Technology Research, Development, and Demonstration (RD&D)* to assess the utility of EDP's innovation process. The IEA framework (*see exhibit 2 – IEA framework*) indicated that the research and development of innovation is only a portion of the total schematic of the innovation system and that **demonstration, deployment, and commercialization** of the innovation is

similarly as important. **Feedback** from the market and from technology users during the commercialization and diffusion phases can lead to a number of **spillover benefits** including additional RD&D, which drives continuous innovation. Furthermore, it was indicated in the framework that “intelligent choice of energy **RD&D priorities** will facilitate market deployment of new and improved technologies; yet priority setting is an ongoing process that requires regular evaluations.”^{iv} These two components, as well as having effective **strategic partnerships** and an **effective governance structure** and **successful institutionalization** of technology innovation are key components of a successful R&D strategy for a utility company. According to the IEA framework, successful R&D institutions for energy innovation share the following five governance characteristics:

1. A **clearly defined mission** linked to a larger systems perspective;
2. **Leaders** with proven **scientific and managerial excellence**;
3. **Entrepreneurial culture** that encourages both **competition** and **collaboration**;
4. Management structure that balances **independence** and **accountability**;
5. Stable and **predictable funding**.

However, even though these five characteristics were constant among successful R&D institutions, there appeared to be *no unique accepted way to measure the innovativeness of an organization*. Nevertheless, many metrics have been proposed and used to measure and benchmark innovation performance. **Input** metrics, **process** metrics, and **output** metrics are all utilized in R&D measurement and evaluation. Examples of **input metrics** include *R&D and innovation spending*, *the number of ideas generated*, and *the number of partnerships initiated*, among others. **Process metrics** include the *failure rate*, the *stage-gate pass rates*, and the *average time from idea to approval* whereas output metrics could include the number of new customers, ROI on innovation spending, or total revenue from an innovative product or service, among others.

- **The Competitors**

The traditional business model of the European electricity supply industry is facing rapid and severe **changes**, which will more than ever affect the role of innovation within utility companies, namely EDP.

In order to assess EDP Innovation's current KPI's sustainability and analyse if these were in line with their competitors', the team performed an extensive benchmarking analysis based on the **ESMT Innovation Index** (see *Exhibit 3: Ranking and composition of ESMT Innovation Index 2012*).

This index measures the innovation activities of 16 majors European utilities^y between 2007 and 2014. It takes into account indicators for process innovation, like the utilities' performance regarding productivity and sustainability, in combination with R&D expenditure, patents and research areas.

Between 2007 and 2011, the **combined R&D budget** of the companies analysed, grew by 47%, from €1.16bn to €1.71bn (see *exhibit 4 – R&D Expenditure of European Utilities*). However, R&D budget approximately 10%/ year between 2011 and 2013. Nonetheless, this trend has been upturned in 2014, where expenditures rose by 4%. The group has concluded that companies in the sample have **readjusted and focused** their research activities between 2012 and 2014; interestingly, the total number of patents issued¹ in 2014 (80) was approximately one-fifth of those issued in 2010 (381). One possible explanation for this drop should be sought in the increasing interest of companies towards **open innovation** and **co-investments** into promising start-ups located around Silicon Valley².

According to the ESMT Index Analysis, the **strategic posture** of the 16 energy utilities could be catalogued into three different specific bunches (see *exhibit 5 – Company clusters based on ESMT*

¹ Patents registered at the European Patents Office (EPO)

² E.ON and RWE opened offices in Silicon Valley to be closer to the hub of digital innovation

Innovation Index). In the first group, companies have a robust focus on research activities (large amount of R&D expenditure and wide range of research areas) or collaborations, and a successful track record on patents over the time period 2007-2011 include companies such as EDF, RWE and Fortrum. The second bunch, which contains companies with successful implementation of innovative processes and technologies but a lower focus on in-house research, includes EDP, which had the highest score in the overall ranking of the ESMT Index in 2012. By 2014, this cluster experienced some changes that better represent the strategy of those companies. For instance, while Statkraft and Dong – that have moved from the third cluster to the second cluster – are pursuing a “pure” dissemination strategy, Iberdrola^{vi} has moved from a straightforward dissemination position to hybrid innovator with a strong focus on R&D activities. Thus, we can conclude that some utilities are trying to pursue a **hybrid strategy**, combining **the benefits** of both **R&D-driven strategy** and **nimble implementation** of innovative processes. The third cluster, companies with a modest focus on R&D, but also with a moderate performance in productivity and/or sustainability, comprehends roughly the same companies for the entire period 2007-2014. Interestingly, E.ON is included in this group. Nevertheless, some of the innovative projects in its pipeline, for instance offshore wind farms, are not yet embodied in the metrics but might be translated soon into higher performance scores. However, since 2010, E. ON has experienced a decrease in its EBITDA of approximately 54%. Hence, for E.ON, the strategic importance of aligning their innovation in one direction seems to be constricted.

Finally, many of the European energy utilities have started considering **new approaches** toward innovation, as **accelerators, corporate incubators, venture capital units** and **co-investments** in start-ups (*see exhibit 6 –New Approaches towards Innovation*). Enel and E.ON have set their own incubators and accelerators, while Iberdrola since 2008 has spent €50m in disruptive technologies through its corporate venture capital program, Perseo. However, old innovation approaches will

not completely disappear, but they will coexist in the future, as demonstrated by EDF with the opening of its new research center³.

- **Current Situation at EDP Innovation**

Finally, in order to better explore the business needs of EDP Innovation and assess if the company indeed has a culture that fosters innovation, we conducted four interviews with different strategic areas inside the company – three with company’s Managers from the areas of Cleaner Energy, Energy Storage and Smarter Grids, and one with an Executive Board member of EDP Innovation (*see exhibit 7 – Interviews guidelines*).

From these interviews, the team identified three main issues that were undermining the capture of value by the activities of this strategic area to its fullest potential: **idea generation, strategy alignment** and **culture**.

Innovation projects originating at EDP-I and the business units are governed by a structured process (*see exhibit 8 – EDP-I structured process*), which is overseen by the workgroups and the innovation committee. The first step of this process is **sourcing**, followed by **screening, analysis** and **delivery and implementation** – ending up in closure or hand-off to other business units. However, in order to perform this process successfully, generating valuable ideas is crucial. After performing our interviews with the company’s managers, we have identified issues concerning idea generation that can affect the success of this process. The potential reasons for these issues were about the **quantity, quality** and **selection** of ideas.

EDP-I follows a model of **open innovation**, sourcing innovative ideas at the global level, and leveraging its innovation effort with meaningful partnerships. Thus, if ideas can come from a plenitude of sources, then logically the higher the **quantity** of ideas generated, the higher the

³ EDF R&D has got a new research center in Palaiseau on the Paris-Saclay campus, which will be the largest industrial research and vocational training center in Europe.

probability to achieve a higher idea *quality*. Additionally, an **advantage of open innovation** is the idea that the value of the best idea generated generally increases with the variability of the ideas received. Moreover, an effective **idea selection** is critical to **systematic innovation**. However, is the selection process being executed by the right people making the crucial decisions in a timely manner, so that innovation continuously advances? One of the factors that indicated that the process was not operating at maximum efficiency was the existence of a substantial overlap in EDP-I's **project origination** and **selection process**, creating an unclear differentiation between the business units and the project teams.

Furthermore, we have also identified issues regarding the **strategic alignment** of EDP-I, and the lack of a clear and aligned purpose of the company. By approaching different managers of different areas within EDP-I, we realized that the **purpose of EDP-I** was not always clear among all of the business units, and this was reflected in how innovation is structured within the group. One of the key insights from our interviews was that the rationale behind open innovation is well perceived and well embraced on the different teams -but managers expressed their wish to have a **more standardized process**, in order to move more efficiently through the innovation pipeline.

Finally, the last issue we have identified is **cultural**, and it is related with the existence of a **conservative mind-set** and the presence of **communication problems** within the EDP Group. On one hand, one of the main purposes of the board of EDP-I is to promote innovation within the Group. Through the creation of EDP Ventures and the open innovation philosophy, there was an ambition to maximize the global innovation effort, but only with a **light internal structure** to support it. However, more innovation comes with more risk, which is not aligned with the culture at EDP-I, still anchored to a very traditional and conservative mind-set of utility companies and promoting an extremely **controlled risk exposure**. Thus, innovation needs to be promoted within the whole EDP Group, in order to overcome this conservative attitude that is still very present.

Finally, in order to assess the effectiveness of possible changes in these three strategic issues undermining the capture of value by EDP-I, the team believed that new metrics needed to be incorporated into the company's balanced scorecard, their performance management tool - while an effective balanced scorecard incorporates insights on the **inputs, processes, outputs** and **outcomes** of the innovation process, EDP-I's only includes financial and operational indicators for their analysis of the projects currently in the pipeline.

Following the analysis performed to the utilities industry environment, EDP Innovation's competitors and their current situation, the team was now prepared to propose solutions to the company's problem - and present new disruptive KPIs to be adopted by EDP-I so that the Balanced Scorecard accurately reflected the value added impact of the projects currently developed.

2.2.3 Methodology

In order to understand how effective EDP Innovation was in achieving the proposed objectives, we have separated our work into three main processes.

Initially the team performed an **analysis** of the industry's **best practices**, by benchmarking the 16 major European utility companies between 2007 and 2014 and researching about the entire utilities industry. After that we have **assessed the utility of the EDP-I's current innovation process**, by using the IEA Framework and interviewing key strategic EDP-I's employees. Finally, and as a result of our benchmarking, research and analysis efforts we **have proposed a new Balanced Score Card** to be used by EDP Innovation. We did this by integrating new KPIs that we found to be relevant on determining the company's strategic goals and tracking their performance on their old Balanced Score Card, therefore improving EDP Innovation's decision-making process.

2.4 Recommendations to the company

As mentioned in the previous section, the current issues identified within EDP Innovation can be condensed to mainly three points: idea generation, strategy alignment and culture. However, there are several recommendations that could help EDP-I improve its current internal situation.

Starting from the first point, **idea generation**, from our analysis we realized that the process is not as efficient as it should. Potential reasons originating this can come from three different sources: *quality* or *quantity* of projects, or from the *selection process* itself. Statistically speaking, the more ideas are generated, the more likely it is to have a good quality. And the higher the diversity in sources, the higher the quality of ideas generated.

However, unclear division of responsibilities and work throughout the project generation and selection process have been identified as the main pain points. Actually, due to the reduced manpower, there is *no clear differentiation* between business units and project teams, which could potentially lead to a substantial overlap between the different parties, and eventually negatively impact the selection of projects. To effectively overcome this problem, the first step is *to clearly define roles and responsibilities* in order to lead the innovation processes. Each step of the project selection process should be clearly assigned to a predefined team. Clearly, this will have an effect on the number of people integrating the teams, which would have to be adjusted in the future, in particular in business units visibly below the desired number of employees such as Energy Storage. Moreover, there would be other benefits of this better definition in teams, since having well-organized processes in place contributes significantly to the success of the final outcome. Therefore, in order to improve this process and remove potential inefficiencies within it, EDP-I should introduce KPIs and targets, with the purpose of driving the right behaviour among decision makers at each level. Likewise, EDP-I should introduce stage-gate pass rates for each step of the selection process. Furthermore, the number of new ideas inflowing the screening process should

be correlated with the employees that would be available to work on them. By doing that, the urgency of employee needs would be more observable.

The next issue – **strategy alignment** – can and should be enriched by several actions. In fact, the purpose of EDP Innovation is not always clear among all the business units. This is reflected, for example, in how innovation is structured within the group.

Therefore, in order to tackle this issue first of all, the innovation vision of employees should be standardized. From our interviews, it emerged that some employees perceive “Passing on projects to other business units” as the ultimate goal of EDP-I – which is not a suitable vision to keep the staff incentivized. Moreover, if the strategy is aligned toward a specific set of goals, the process of discovering and embracing new trends can be fostered, which will help EDP-I being better prepared for the future.

The third and final issue is related with **culture**. Unsupportive culture and climate are often quoted by CEOs as the most common internal organizational barrier to effective innovation, in particular regarding the ability of projects to fail without penalties^{vii}.

Although one of the focus of the board is to promote and foster the open innovation philosophy within the group, more innovation comes with more risk and the culture seems still to be anchored to a very conservative mind-set. And although it would be challenging demanding that a company’s mind-set would be altered in a short-term, we believe that a very risk-adverse culture can be slowly influenced and ultimately soften.

Moreover, *increasing promotion* within the company could also be a way of facing this problem. Thus, EDP should promote the idea of *learning organization*, where employees would be able to share ideas and knowledge freely across all different departments. Furthermore, the company culture should be more inclined to adopt a supportive attitude: for instance, major innovation projects could be sponsored by a top-management executive, who would be committed with the

success of that project. Additionally, specific reward systems designed to recognize employees for their innovation efforts could be presented. Finally, the role of training on the innovation processes and the motivation of the project owners should not be underestimated. As an overall KPI for checking on cultural improvements within the group, the percentage of employees that are aware of processes within EDP-I could be measured on a constant basis. The **Portfolio Projects Visualization** (see exhibit 9 – *Portfolio Projects Visualization*)—which provides a quick overview of the rank of each project and its characteristics – could be used as an additional tool to increase awareness across all the business units. Thus, this approach would not only lead to more effective knowledge sharing but also to an indirect incentive for EDP-I’s employees.

A more general recommendation concerning common practices in the industry is to *broaden the scope of innovation*. The trend is not focusing solely on traditional business units (*managed innovation*) – for instance increasing the operational efficiency of a coal-fired power plant – towards a more open approach, that incorporates exploring completely new fields (*diverse innovation*) – for instance co-financing accelerators specialized in specific solutions⁴. By increasing the variance of inputs and growing the number of people generating ideas in the respective new fields, new revenue streams could be reached, which could lead to the creation of a competitive advantage. By financing *diverse* forms of innovation, EDP can send a signal to both external and internal parties: Externally – to stakeholders, shareholders and investors – that the company is in the right track to tackle the challenges of the market; internally – to middle management and employees – that a new mind-set is being embraced.

After having addressed the current issues within EDP-I and having proposed our recommendations, it is now possible to *analyse the current balance scorecard*.

⁴ EnBW co-finances the Berlin branch of global accelerator Startup Bootcamp, which specializes on energy and transport solutions.

The balanced scorecard currently used by EDP-I incorporates almost exclusively financial measures, which just partially reflects the effect of innovation. In order to do so, **input**, **process** and **output** metrics should be introduced. With respect to KPIs, although there are various useful KPIs to choose from (*see exhibit 10 – Most commonly used KPIs in R&D*) these four are the most beneficial: Regarding input metrics, the **number of new ideas generated** should be actively used as a measure of Innovation. As explained above, an increase of ideas generated is the key to strengthen innovation activities and develop a competitive edge. Considering process metrics, the **number of ideas approved vs. the number of ideas implemented** appears to be a valuable stage-gate measure to monitor the efficiency of decision processes. Absolute R&D Productivity⁵, tries to quantify R&D's overall performance and to shed light on separate aspects of productivity. The usefulness of this metric lies in the way it drives the right behaviour namely, better forecast and management's attention on the ongoing most critical project's, faster time to market and efficient execution. As referenced by the managers during our interviews, the number of new products or services introduced could be added to the scorecard as effective output metric. The new KPIs abovementioned could be introduced directly in the previous scorecard without changing its structure.

Additionally, we proposed EDP a new scorecard to equally evaluate each single project based on the same metrics: Financial, Organization, Project Risk and Market. All of these sections have sub-sections (*see exhibit 11 – Portfolio Projects Visualisation rankings*). For each metric, the evaluator of the project should give a score from 0 (very low) to 5 (very high). The weight of each metric should be discussed within EDP, however the total sum of each weight should equal 100%. The score of each sub-section times its weight will give the final rating for each section. In case a

⁵ Multiply a project's total gross contribution by its rate of maturation and then divide the result by the project's R&D cost

project score in the Risk section is less than zero, the interpretation would be that the mitigation factors offset the risk factors. Finally, the overall project score will be the result of the sum of all the final ratings in each section – Financial, Organization and Market – minus the sum of the residual risk – risk factors minus mitigation factors (*see exhibit 12 – Overall Project Scores*).

Beside the evaluation scorecard, two additional elements have been suggested to the client, namely: **Portfolio Project Visualization** and **EDP Innovation Index**. The former component tries to rank projects according to their level of change – *incremental or radical* –, their level of newness – *Process or Product/Market* – and their value (€). Values on both axis range from -10 to 10. According to the level of change or newness, scores must be given. For instance, an extremely disruptive innovation will receive a score of 10, while a strong incremental innovation will receive a score of -10. Values between this set are allowed. Similarly, if the innovation is related with a process, a score less than -5 would be given, if instead is more related with products or new markets the project will receive a score higher than 5. Values between this set are allowed as well. However, two categories above could be interdependent. Actually, while product innovation is more likely to be present in the early stages, process is more prone to appear on the later stages.

As a final point, let us dive in into the second element suggested to EDP-I. The **EDP Index** is designed to monitor the level of innovation throughout a specific time period. It takes into consideration 4 factors: EBITDA, ideas approved VS idea implemented, absolute R&D productivity and number of new product/services. However, those KPIs and their weights in the index, might be changed according to the importance EDP gives them. The indicators are taken directly from the current scorecard. Each indicator will have a score – Indicator Score – which represents the deviation from the actual value versus the budgeted one (in %) times its weight. The final EDP Innovation Index will simply be the sum of each Indicator Score. (*see exhibit 13 and 14– The EDP Innovaton Index-Example*).

When comparing EDP and its competitors, we realize that EDP's percentage of EBITDA invested in R&D is substantially lower when compared to its main competitors. Since there is no direct correlation between the R&D expenditure and sales growth, and R&D is only a necessary condition to compete, but not a sufficient one to succeed, as a final recommendation we strongly encourage *increasing the R&D investment* in order to keep up with the direct competition.

2.4 Concerns (shortcomings, implementation problems expected)

The first issue we faced during our project was related with the **scope of the problem**. At the beginning, the boundaries of our scope were a bit confusing. The angle we were asked to cover was fairly wide and it seemed we were trying to “boil the ocean”. Specifically, there was no clear understanding whether we needed to analyse the projects currently within the pipeline, or throughout all the phases of the process. On top of that, the fact that we weren't able to have a clear and straightforward idea about the vision and the purpose of EDP Innovation – “creating innovative solutions” was somewhat vague – it has only made the scope even harder to define.

However, after having framed the problem our initial idea was to analyse different Balanced Scorecards as possible from our competitors. We spent almost two weeks to try to contact employees from different companies within and outside the industry. Yet, soon we realized our second problem: the demand we were requesting was too ambitious. In fact, those documents were either *confidential* or *extremely important* from a strategic point of view.

The third issue was related with the interviews within EDP. The sample of the interviewees probably was not extremely large because those were the only people the company allowed us to interview. Nevertheless, the quality of the answers extrapolated from the interviews offset the quantity of interviewees.

Lastly, although we consider our suggestions and KPIs to be relatively easy to implement in terms of cost and resources employed and even if EDP Innovation would decide to ultimately implement

them, our concern would be more about the use of those tools. The main risk is that in the long run, the lack of engagement from the senior management would could frame the decision-making too much and make the all the decision process just a mere additional point in their “to-do-list”.

2.5 Individual contribution

After developing our Business Project, I can now reflect on my individual contribution to it and the value added of my participation. This project was unique from conception to completion, due to its very practical subject, which lead to an also different group dynamic than what I was used to from other school group works. Firstly, since we were solving a real-life problem for EDP Innovation, we needed to act as a consulting team, which involved mostly working all together to analyse and address the company’s challenges. However, as expected, team members’ areas of expertise and even availabilities throughout the semester were not the same, which implied a different focus for each one of us in one area of the project.

Firstly, I performed the research and analysis of the innovation environment in the energy industry, characterizing it in order for us to better understand its dynamics and EDP Innovation’s main challenges faced. I also benchmarked the company’s competitors, in order for us to know if EDP Innovation was following the industry’s best practices. However, my main focus was analysing and developing the current issues identified with EDP Innovation, of idea generation, strategy alignment and culture. This was also the reason why I decided to use my Work Project as a chance to further develop on the issues undermining EDP-I’s capture of value, trying to present opportunities for the company to overcome these problems.

3. ACADEMIC DISCUSSION

3.1 Link with the MSc in Management

The MSc in Management at Nova School of Business and Economics is a program intended to provide students with both personal and academic development in a variety of areas, in order to

better prepare them for a wide range of careers in management, from consultancy, to fast moving consumer goods or even financial services.

Having a major in *Strategy and International Business*, throughout the development of this Business Project the topics that I considered more captivating were the ones related with the strategic concerns behind innovation management. Thus, I want to better analyze the reason why EDP wants to achieve growth through innovation, but is not always successful because their processes, culture and approaches are undermining them.

3.2 Relevant theories and empirical studies

Nowadays, companies worldwide massively invest management time and money in innovation – however, this still remains a frustrating pursuit in many companies. The implementation of innovation initiatives frequently fails, and successful innovators have a hard time sustaining their performance - as what happened with Polaroid, Nokia, or Yahoo. But why is it difficult for companies to build and maintain the capacity to innovate? Research shows that the problem with innovation management efforts is rooted in the lack of an *innovation strategy*^{viii}. Following this, in my academic discussion I want to answer the research question “*How can EDP Innovation capture and deliver more value by bringing efficiency to their strategic innovation processes?*”

As a result of the work developed on the Business Project and mentioned before, we realized that the innovation process at EDP-I was not as efficient as it could potentially be, with issues appearing ever since the process of idea generation up to the closure or hand-off of the projects to other business units. These issues aroused due to the existence of inefficiencies in three components of EDP-I’s innovation strategy, that were undermining the capture of value by the activities of this strategic area to its fullest potential: **idea generation, strategy alignment and culture.**

Knowing that EDP Innovation could capture more value by bringing efficiency to their strategic

processes if they were able to overcome these three issues, I believe it would be relevant to apply specific frameworks to each one of these problems, providing EDP Innovation with valuable insights on how to avoid them in the future. Accordingly, in order to analyse the problem of **idea generation**, I believe the *Innovation Search Space* framework, from the *Managing Innovation* book is the most suited to use; for the issue of **strategy alignment**, I will base my analysis on an *innovation process model* developed by Joe Tidd and John Bessant on the *Managing Innovation* book; and finally, for the issue of **culture** I will use the *Strategic Leadership View* model, explained on the book *Innovation Management* by Allan Afuah.

Companies must *innovate in order to survive* on the market. The early activities of the innovation process, especially idea generation and selection, are one of the most important stages for a successful innovation process. As EDP Innovation uses a model of open innovation, obtaining ideas from a multitude of different sources, having a standardized framework to summarize the different sources of innovation and how to organize and manage the process of searching for them would be valuable. The *Innovation Search Space*^{ix} framework (*see exhibit 15 – Innovation Search Space framework*) focuses on two variables: *type of innovation* – radical or incremental – and *environmental complexity* – established frame or new frame. It states that firms can innovate at a component level – the left-hand side – in both incremental and radical fashion, but such changes take place within an assumed core configuration of technological and market elements – the dominant architecture. Moving to the right of the framework introduces the problem of new and emergent architectures arising out of alternative ways of framing amongst complex elements. Organizations learn to manage innovation within their already pre-established space, and build routines embedding structures, processes and networks to support and enable work within it. Thus, in mature sectors, such as utilities, there is the dominance of a particular logic, which *gives rise to business models of high similarity* – which is what is happening with EDP Innovation, where

innovation projects are primarily based on process enhancement rather than product and lead to incremental change.

However, as explained by the Edison Electric Institute^x in their last disruptive innovation report, in order to maintain a high performance in this industry, *companies need to keep up with the current phenomenon of customer disruption in the energy industry*, and embrace the importance in disruptive technology and business models. Thus, EDP-I is currently on the *Exploit* section of the Innovation Search Space, but should also adopt practices that allow the company to perform an efficient idea selection process for disruptive projects, on the *Bounded Exploration* section. In order to achieve this goal, I believe it would be beneficial for EDP Innovation to **invest further in R&D**, and **mobilize a network** of specialized researchers, for example by establishing further partnerships with universities, to form specific strategic alliances and joint ventures around a particular area of deep technology exploration.

Furthermore, the team has also identified issues regarding the **lack of a clear and aligned purpose** of EDP Innovation, and the nonexistence of a standardized process for projects to move in the innovation pipeline. Thus, I believe the company should implement the *innovation process model* developed by Joe Tidd and John Bessant on the *Managing Innovation* book^{xi} (*see exhibit 16 – Innovation Process model*).

Successful innovators acquire and accumulate technical resources and managerial capabilities over time. And even though there are various opportunities for learning, they all depend upon the *readiness of the firm* to see innovation less as a lottery than as a process that can be continuously improved. Best practices have demonstrated that *systematized innovation activities* have helped companies reaching success and establishing competitive advantage over the other players in the market. Adding this to the fact that EDP-I's managers have also required the adoptance of a more standardized process, I the consider *innovation process model* to be a good fit with the company.

This framework addresses two crucial questions: “*Do we have a clear innovation strategy?*” and “*Do we have an innovative organization?*”. It is composed by four different phases: (1) **Search** – how can we find opportunities for innovation? (2) **Select** – what are we going to do – and why? (3) **Implement** – how are we going to make it happen? (4) **Capture** – how are we going to get the benefits from it? I have previously addressed the *search* phase with the previous framework. However, I believe there are opportunities for EDP Innovation to improve on the other phases.

Firstly, the *selection* phase is based under the assumption that *innovation is inherently risky*, and even well endowed firms cannot rake unlimited risks. It is thus essential that some *rigorous selection* is made of the various market and technological opportunities, and that the choices made fit with the overall business strategy of the firm, and build upon established areas of technical and marketing competence. This does not mean that firms should not move into new areas of competence (as there needs to be an element of change if there is to be any learning for the company), but rather there needs to be a balance that fits the company’s overall business. In my opinion, EDP-I should **deepen** this **selection process**, and establish more rigorous criteria on the type of projects their limited R&D funds should be allocated. In order for this to happen, there should be a higher involvement of the top management level with the lower levels inside the organization, to jointly draw EDP-I’s intended areas of investment.

The third phase of this framework is *implement*, the actual turning of the potential ideas into some kind of reality (a new product or service, a change in a process, or a shift in a business model). Technological and market research help clarifying whether or not the innovation is technically possible, if there is a demand for it and if so, its characteristics. This implementation phase can be further divided into three main elements: acquiring knowledge, executing the project, and sustaining the innovation. Acquiring knowledge involves combining new and existing knowledge (available within and outside the organization) to offer a solution to the problem. Currently in EDP

Innovation there is a major overlap between the different business units and the project team; however, the division of work and responsibilities are not 100% clarified. Thus, I believe this is an opportunity for EDP Innovation to leverage on. Knowing that acquiring knowledge is crucial for the implementation phase, I believe there should be a better aligned communication between the project's teams and the different business units, where the designed business units would provide specialized inside information that could help develop and implement the different projects.

Finally, the last phase of this framework is *capture*. The purpose of innovating is rarely to create innovations for their own sake, but rather to capture some kind of value for them, such as increase in revenues, market share or a cost reduction. However, not all innovations are able to deliver the value they were meant to. There are various methods for this capture of value, from formal methods such as patenting through to less formal like the use of tacit knowledge. Moreover, opportunities also emerge for learning and development of innovations and the capability to manage the process which created them – however, this willingness to learn from completed projects is not always taken up by organizations. In my opinion, currently EDP-I is not doing a rigorous follow-up process on the projects, as one of the company's managers even admitted his ultimate goal was “pass on the projects to other business units”. Thus, I believe that further developing this willingness to learn, by creating a standardized process to assess how the entire project origination and selection process was done, can act as an opportunity for EDP Innovation and ultimately increase the efficiency of their future projects.

Lastly, in order to analyze the issue of **culture**, I will use the *Strategic Leadership View* model, explained on the book *Innovation Management* by Allan Afuah. The model argues that the strategic incentive to invest in an innovation or the failure to exploit it as a result of destroyed competence come only after a firm's top management has recognized the potential of the innovation. Top management makes the decisions to invest in an innovation, or if such decisions

are made by lower level managers, they still reflect the beliefs and values of top management. But its incentive to invest in an innovation or its ability to embrace and exploit the innovation is a function of the extent to which the firm's top management recognizes the potential of the innovation. This ability of top management to recognize the potential of an innovation is a function of its managerial logic, or view of the world, which in turn depends on management experiences, organizational logic and industry logic^{xiii}. When interviewing EDP-I's managers, we were given the information that communication problems existed inside the organization, which combined with the conservative mind-set that is still present in EDP-I can be undermining their capture of value. Thus, I believe a closer relationship between lower-level managers of the different key areas with top management there should be promoted.

3.3 Recommendation for future research

Our business project challenge was about analyzing the KPI's currently in use by EDP Innovation, assessing their accuracy and sustainability, and providing the organization with new relevant metrics of evaluating the projects currently in their innovation pipeline.

In order to improve the efficiency of the innovation process at EDP-I, I have proposed frameworks that could be used by the organization on overcoming identified issues. However, the suggestions presented by me are *based in theoretical simplified models*, used to focus on key aspects of the innovation management challenge. Thus, even though these models are valid and adaptable to our context, they are lacking a practical enforcement in order for us to confirm with complete certainty that the premises lead to the expected results. Thus, I suggest that further research should be done by applying the above-described frameworks to a real-company context, namely EDP Innovation. This research would be done by pilot testing the framework's assumptions with actual data from the company, on the long-term. Only by doing this we would be able to conclude if these assumptions have the desired results, if they do not have a significant effect on designing a

successful innovation process, or if they can even further undermine a company's situation.

4. PERSONAL REFLECTION

4.1 Personal experience

As I referred before, this project was unique from conception to completion, due to its very practical subject, which led to an also different group dynamic than what I was used to from other school group works. This has also allowed me to better understand my key strengths and weaknesses when working in a team for an extended period, and what aspects I believe I should improve. Thus, I believe my key strengths and weaknesses during the project were:

1. **Team Player** – I believe that the ability of working more efficiently in a team rather than individually is something that not only depends on the person itself, but also on the group they are in. Thus, even though I believe one of my strengths in this project was the facility to work as a real consulting team, building value added discussions all together and analysing problems and overcoming challenges as a group, it was also due to the group dynamics established.

2. **Responsibility, Commitment and Hard Work**– All three competences that are innate to my personality, but were further developed in my MSc, where one is required to go the extra mile in order to be successful. During this project, I was always a highly active member of the group, constantly striving to find new approaches for solving our challenges, and achieving good results.

1. **Time management** – The amount of workload I had from other courses and projects I am involved, combined with the fact that I require some pressure to become more time efficient with work that I need to do kept me from focusing the required amount of time to this project from day 1. This bad time management led to an increased workload in the middle and end of the semester in order to achieve the project quality that I intended, so I believe there is room for improvement – and I should do a better job at planning a project from top to end, in order to more efficiently manage the required workload throughout the available time.

2. **Micro Management** – Being a perfectionist, for me it was sometimes hard to focus on “the bigger picture” and disregard small details that will have a minor impact on the project itself. So, sometimes it was difficult for me to let go of some components in order to progress with the project. This is one of the aspects where I will have to focus on the future, as when working in a company in a dynamic environment I will not always be equipped with flexibility to handle every situation in detail. I plan to tackle this by improving my prioritization capabilities.

4.2 Benefit of hindsight

As a final reflection on the work developed throughout this past semester, it is important for me to strategically assess where I added more value and what could have been done differently.

I believe that the fact that I am practical and pragmatic with a strong focus on the ultimate goals of what needs to be executed facilitated some dilemmas we had in the beginning, when the team had some troubles defining the scope and goals of the project. Moreover, my constant commitment on the success of the project, together with my group members, helped getting the project further and the maintenance of a good working environment. I believe this also characterized the way I added most value to the project, by constantly performing a strict research process, challenging our findings and always striving to achieve more and better results. Furthermore, I believe this enjoyable working environment also benefited from the combination of the mine and the group’s personal traits, as the constant quest for excellence, adaptability and reliability.

However, even though I consider that we were successful in this journey, there are some aspects I would do differently if I started it again. First of all, I would start focusing the required attention on the project from the exact beginning, in order to avoid working under pressure afterwards. Moreover, I would try to get involved with the company earlier as well, in order to contact with more people inside EDP-I, which could have provided us with better insights regarding their innovation processes.

5. APPENDIXES

Exhibit 1 – Innovation Projects at EDP-I

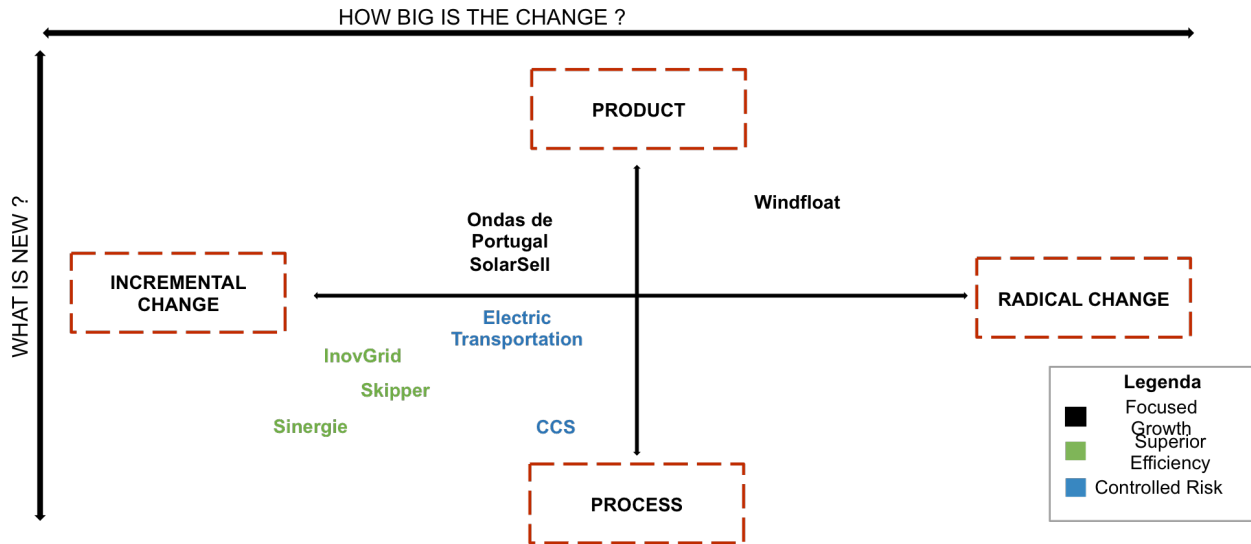
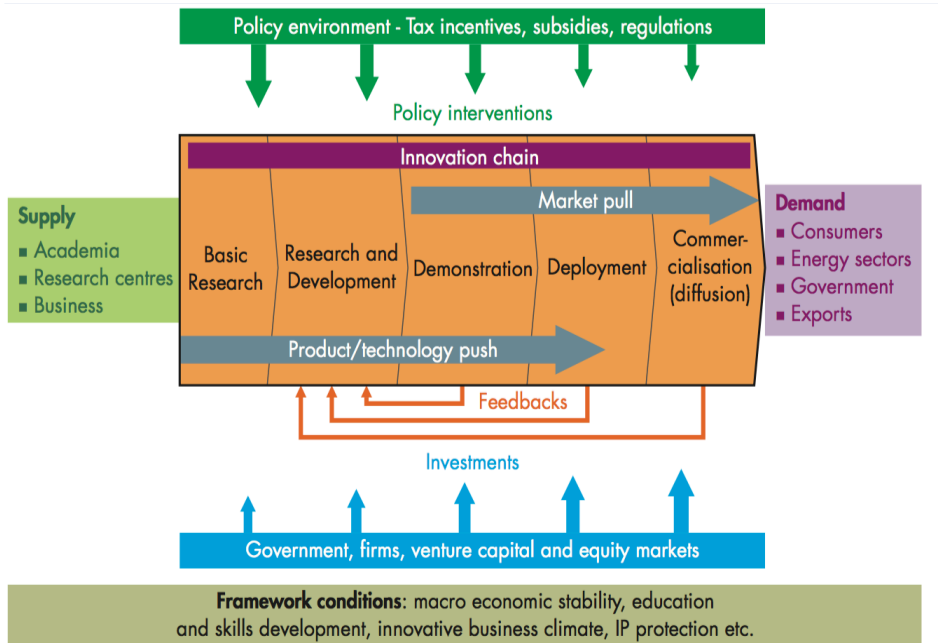


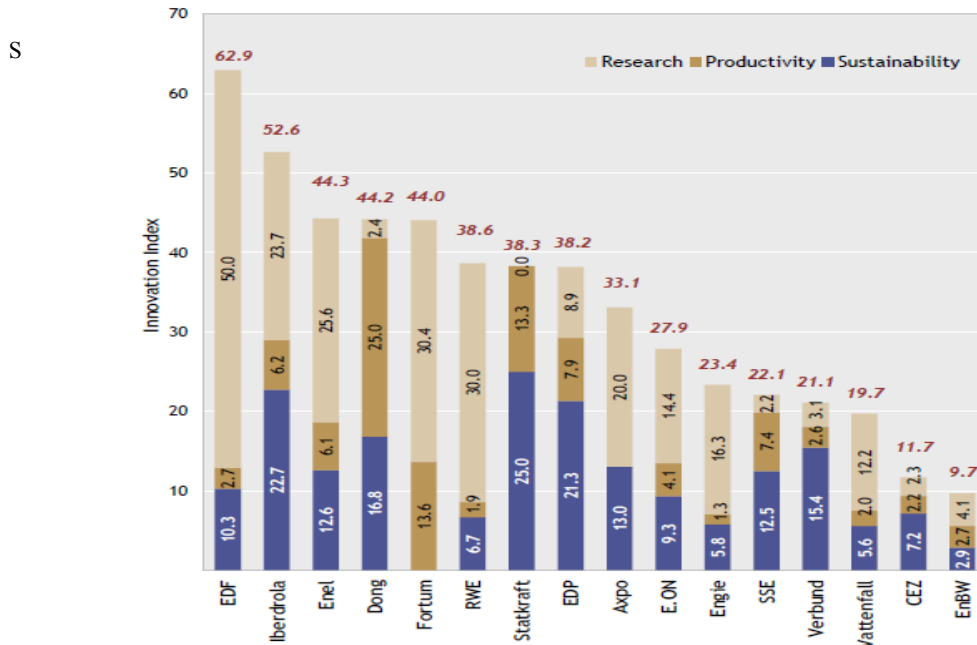
Exhibit 2 – IEA framework



Source: IEA, 2008.

Source: IEA (2008)

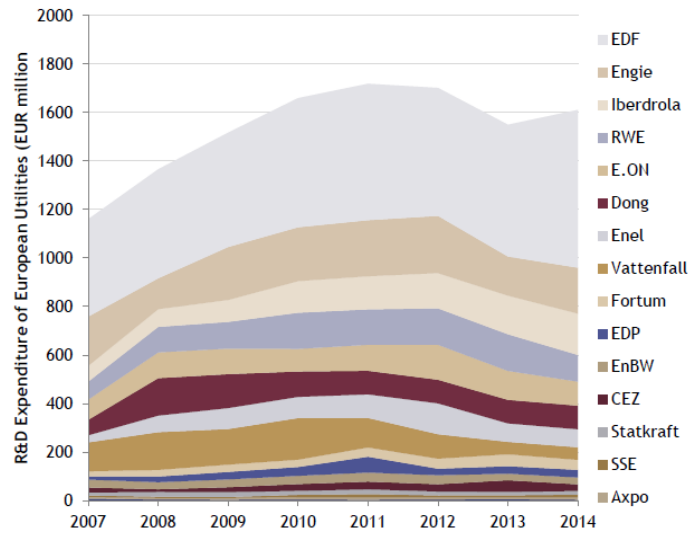
Exhibit 3: Ranking and composition of ESMT Innovation Index 2012



Source: ESMT Analysis (2015)

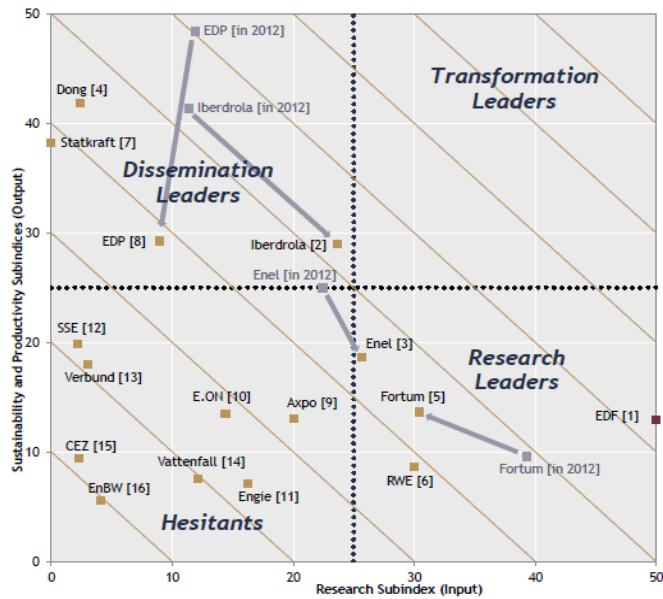
Exhibit 4 – R&D Expenditure of European Utilities - € million

Source: ESMT Analysis (2015)



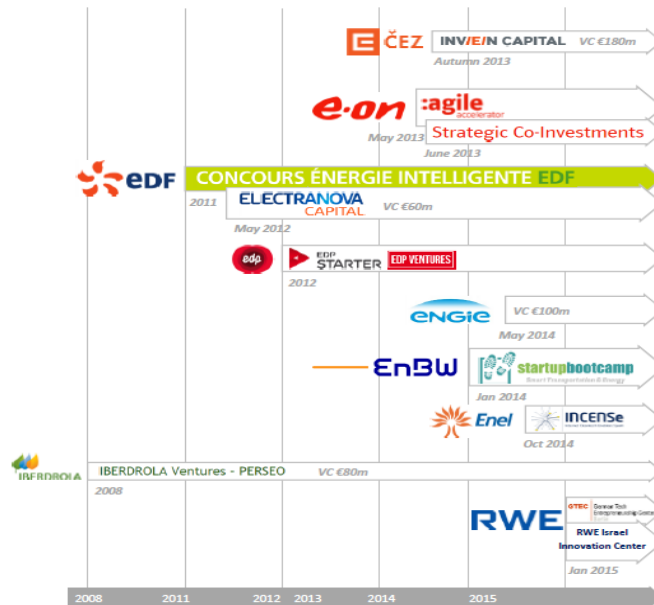
Source: ESMT Analysis (2015)

Exhibit 5 – Company clusters based on ESMT Innovation Index 2014



Source: ESMT Analysis (2015)

Exhibit 6 – New Approaches Towards Innovation - Timeline of exemplary initiatives of selected European utilities in the field of "diverse"



Source: ESMT Analysis (2015)

Exhibit 7 – Interviews guidelines**Questions about Innovation Culture and Strategy**

1. How would you define the desired outcome or purpose of EDP Innovation?
2. When is a project defined as success?
3. Which is your organization's (unit's) primary growth challenge?
4. How is EDP Innovation affecting the performance of the EDP Group?
5. Is there a mandate to encourage innovation inside of EDP Group? (incentive system?)
What about specifically inside EDP-I?
6. In your opinion, what are the overall barriers to innovation culture in your organisation?

Questions about Innovation Process, Measurement, Evaluation

1. Do you differentiate between incremental and disruptive innovations - what are the respective metrics you use to define the different categories?
2. Do the metrics also differ between the different subsections (EDP Ventures, Cleaner Energy etc.)
3. Are projects initiated by technology push or market pull?
4. How often are projects killed? What is the metric to decide whether a project is killed or not and who decides this?
5. Can the average speed to market of innovations be determined at EDP innovation?
Measure of efficiency of the pipeline?
6. What are the overall barriers to the innovation in terms of the process, measurement, or evaluation?

Questions concerning new KPI metrics

1. If you could introduce a new metric in order to measure the impact of innovation, how would it look like?
2. Is there a specific component that you believe should be included on the BSC?
3. On a scale from 1 to 10, as how useful would you assess the following KPIs:
 - a. Number of new ideas deployed p.a.
 - b. Number of new patents or trade secrets p.a.
 - c. Royalty or licensing revenue from intellectual property p.a.
 - d. Number of ideas turned into patents by employees p.a.
 - e. Present Value of Innovations in the pipeline (how to measure in early stage?)
 - f. Number of new patents/ideas in relation to total budget in €100k (or other useful in- and output KPIs in relation to each other)

- g. Number of international partnerships with universities, public research etc.
- h. Number of new products, services and businesses launched in the past year
- i. Ratio of outside vs inside innovation processes
- j. Actual vs. targeted time to market time
- k. % of employees of EDP-I who have received training and tools for innovation management
- l. Number of consequent innovations (innovations resulting from innovations)

Questions for Engineers Pedro Valverde (Cleaner Energy), Pedro Ferreira (Smarter Grids), Andre Botelho (Energy Storage):

1. Do you work on multiple innovation projects at the same time?
2. Do you ever bring your expertise to other subsections of EDP-I?
3. To what extent are the other business units consulted about the innovations currently in the pipeline? Do you get feedback or do you ask for their input when you are developing new innovations?
4. How would you evaluate the communication across different business units?
5. Do you ever use the BSC? Do you think it is an effective tool to measure the innovation and success of the department?

Questions for Luis Manuel (Board Member and EDP Ventures):

1. (Worked 8 years for Galp Energy):
 - a. What were the common practices at Galp in terms of innovation measurement?
 - b. Comparing Galp and EDP: Where is the innovation department better implemented?
2. Are all of the projects supported by EDP Ventures transferred to EDP's other business units? What is the project success rate?
3. What are currently the most important KPIs on the BS that you as a Board Member are looking at at first?
4. EDP Ventures: Are you tracking/measuring the performance of your investments in a way that is different from purely financial metrics?
5. EDP Ventures: How does the screening/ due diligence process look like and what are the key factors for the investment decision?
6. EDP Ventures: Is the ultimate goal of EDP Ventures profitability or having a long term impact on the group through new innovation? *Would you prefer 10% higher profitability or 10% better/higher long term impact for the EDP group?*

Exhibit 8 – EDP-I structured process

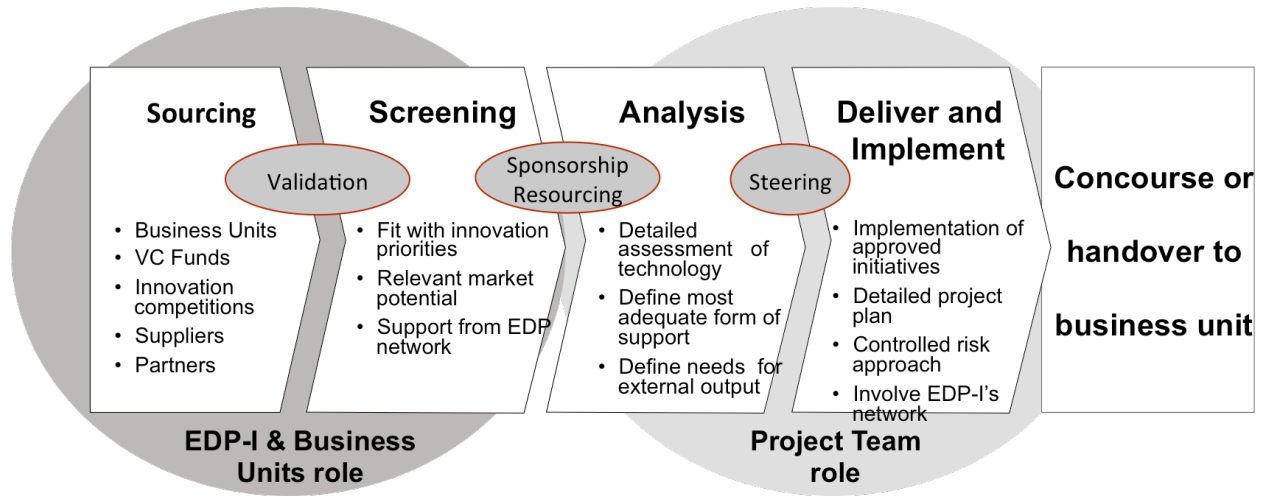
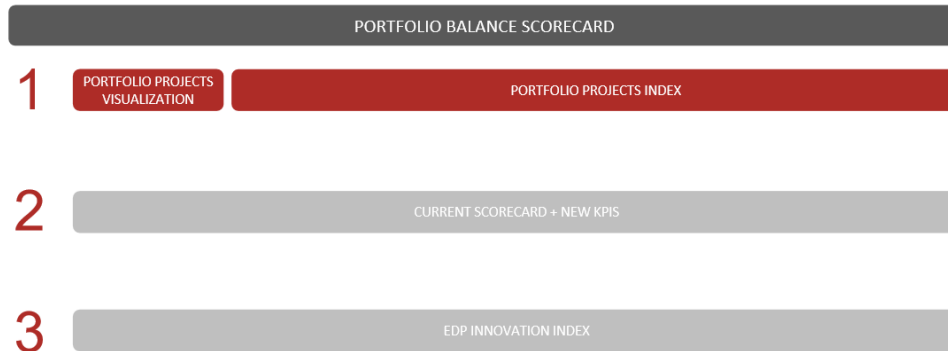


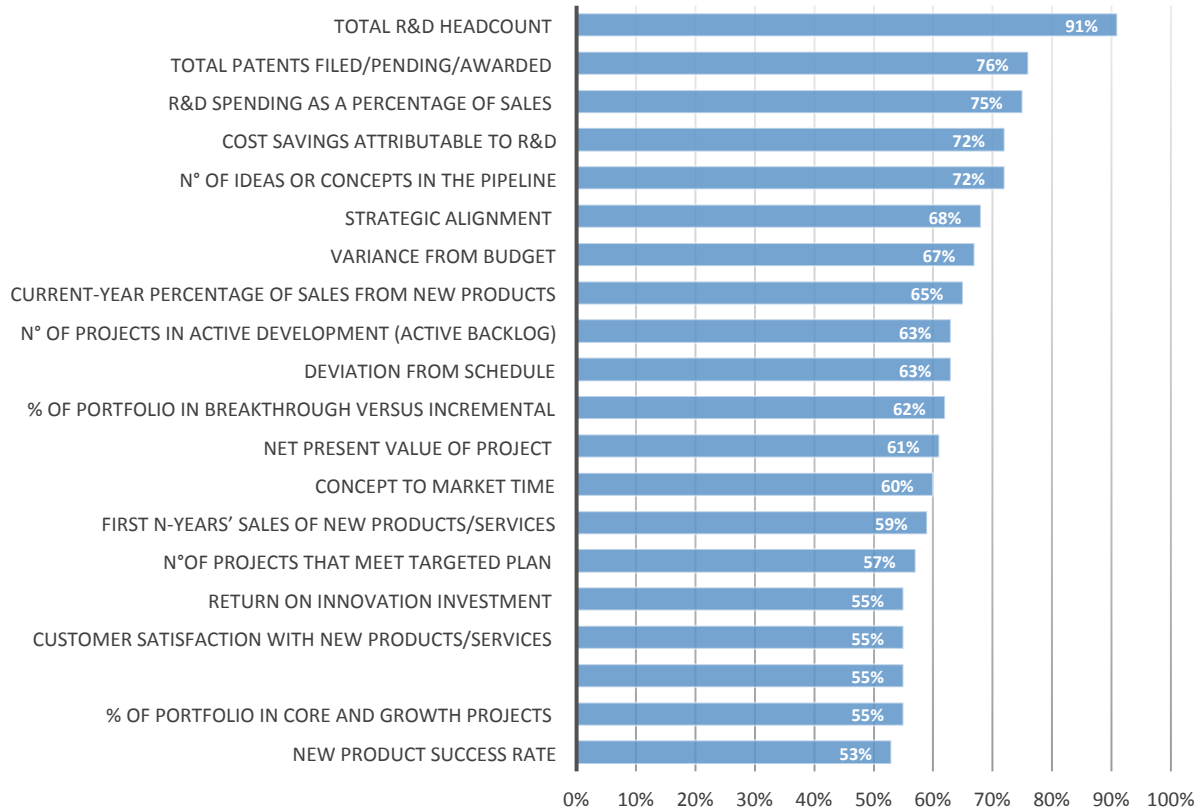
Exhibit 9 – Portfolio Balance Scorecard is composed of three elements: Project Visualization Index,

Current Scorecard + New KPIs, EDP Innovation Index



Source: Business Project

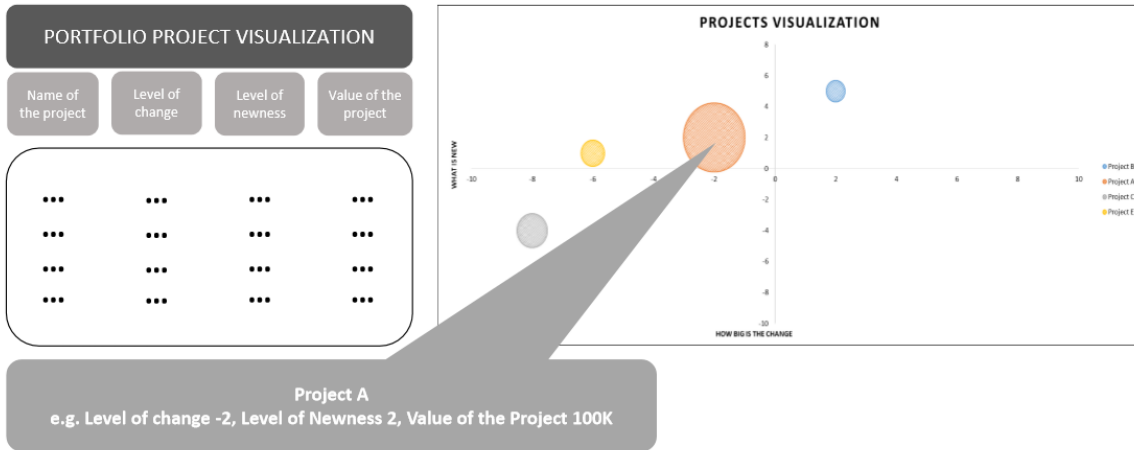
Exhibit 10 - Most commonly used KPIs in R&D



Source: CurrentState of R&D Metrics Complete Findings 24 March 2010, Research & Technology Executive Council of the Finance and Strategy Practice

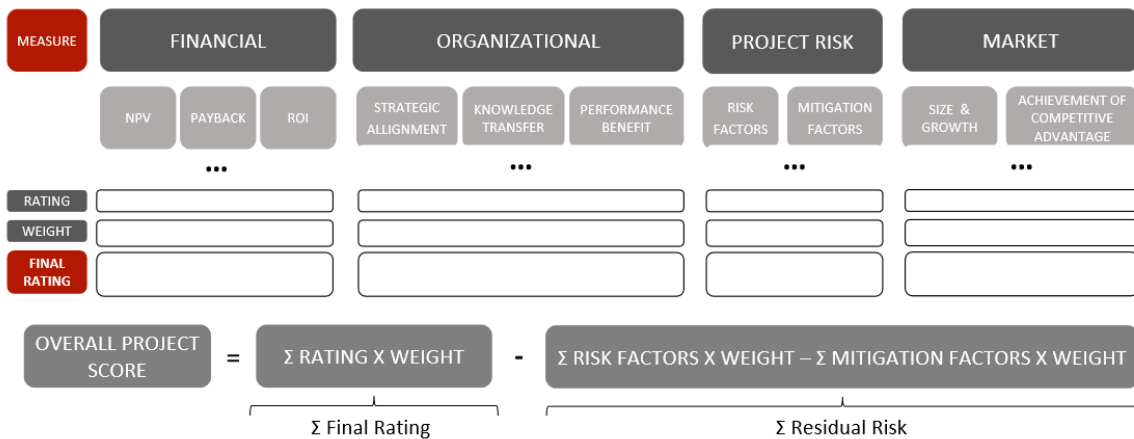
Input	Process	Output
R&D & innovation spending Share of personnel involved % of time Innovation VS Ops Number of ideas generated Number of partnerships	Failure Rate From Idea to Approval – Average Time Ideas Approved VS Implemented Stage-gate pass rates Number of partnerships	# New Products or Services Revenue from New Prod or Service # New Customers # New Markets ROI on innovation spending

Exhibit 11 - Portfolio Projects Visualization ranks projects according to their level of change, their level of newness and their value in terms of €



Source: Business Project

Exhibit 12 - The overall project score is given by: Σ Final Rating – Σ Residual Risk



Source: Business Project

Exhibit 13 - The EDP Innovation Index – Example

Indicators	Weight	Budgeted	Actual	Indicator Score Current Year x Weight	Result Previous Year	Budgeted Previous Year	Indicator Score Previous Year X Weight
EBITDA	40%	-140	70	60%	-120	-100	-8%
Ideas Approved VS Idea Implemented	15%	3%	5%	10%	4%	2%	15%
Absolute R&D Productivity	25%	70%	65%	-1.8%	60%	40%	12,50%
Number of New Products or Services	20%	1	3	40%	7	2	50%
Sum	100%			108,2 %			69,50%

Current EDP Innovation Score

Previous Year EDP Innovation Score

Business Project

Source:

Appendix 14: The EDP Innovation Index – Example

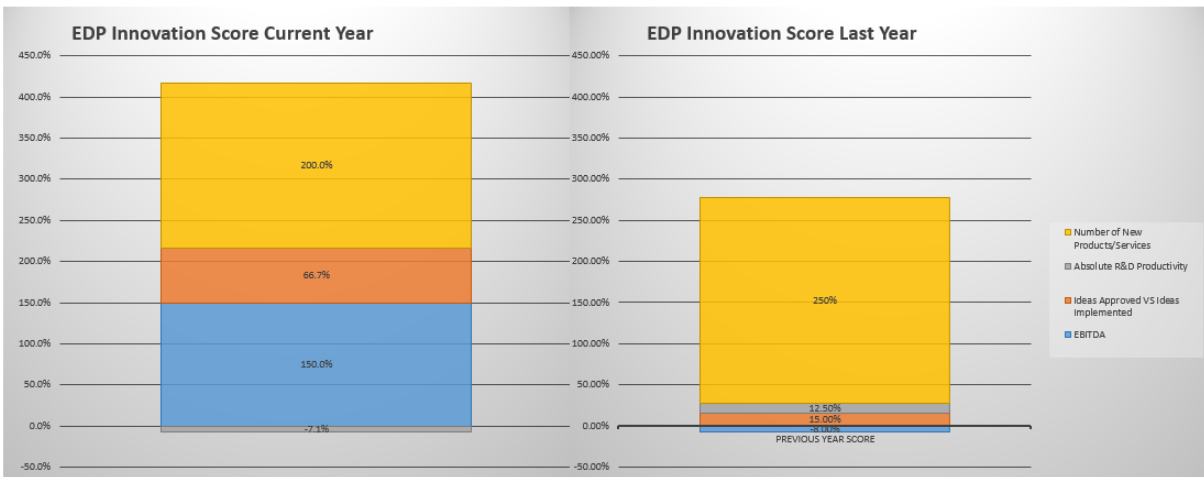


Exhibit 15 - Innovation Search Space framework

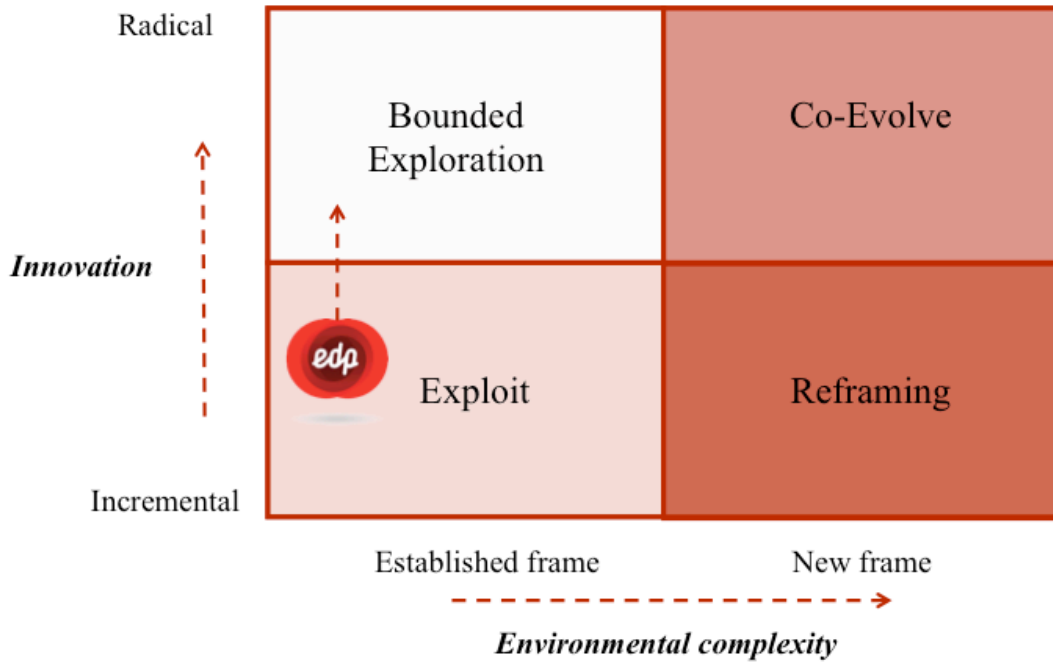
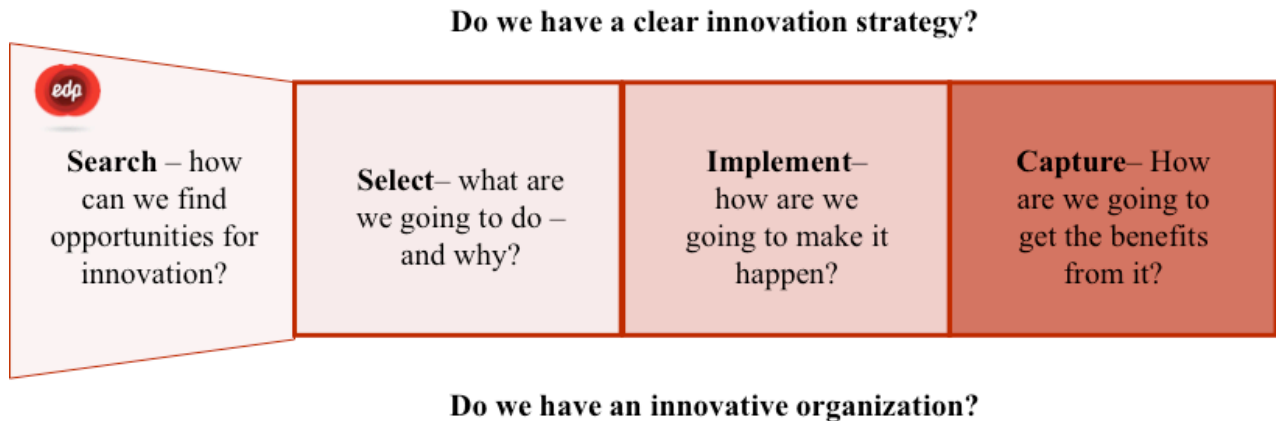


Exhibit 16 – Innovation Process model



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