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**Human Developing Innovation and
Creativity for Business Advantage**

Assignment 1

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What this report entails – aims and objectives

During lessons we talked about innovation - what it is, what drives, how to best implement it – and in this report I will be looking at a practical case study and apply the concepts studied in class.

The main aims of this study are to critically reflect on the causes of innovation and in particular, analyse the role that individuals within an organisation can have on innovation, explore the similarities and differences between some popular innovation theorems and also explore the characteristics of knowledge on an organisational level.

Specific case study

The case study used for this report involves an engineering company that specializes in industrial equipment for factories and hospitals. However, our interest is in the new proposed research project they are undertaking – creating a plasma based toothbrush (essentially) which would help whiten its users teeth by (essentially) burning off all the residue that make teeth decolour.

In the case study we are given information of the funding for the research project and an excerpt of a meeting between the research team members.

The ultimate question that this case study presents us with is: can thus plasma based teeth whitening device be made into a sound investment from a commercial standpoint?

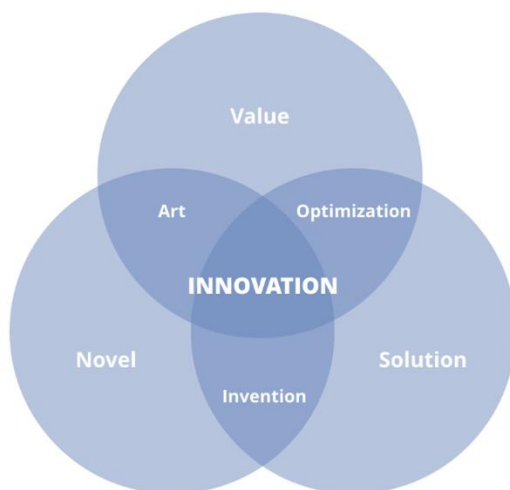
We will discuss these topics in the following sections.

What is innovation

The first task in this report is address the approach to innovation in Stockholm Gases, the company in the case study. Before we can do this however, it is pertinent to provide a brief explanation of what is innovation.

The first search for “definition of innovation” on a search engine leads a particularly difficult answer: there is not concise definition of it, or at least forty of them according to (Edison, 2014). This is in part because what constitutes innovation is different in each particular industry.

However, the core principles of innovation revolve around some common principles that we would all know intuitively. When all of these principles align in a manner that produces a positive result – often improving on some character from previous models – we intuitively recognise this as innovation. This can demonstrated in simplified way in the following diagram.



2003)

Figure 1 – A simple diagram of innovation – adapted (Kuczmarski,

Types of innovation: Open and Closed systems

In class we spoke of types of innovation – the two main ones being closed and open innovation. The principal differences between these two modes of innovation is that:

- In the closed type: innovation comes from within the organisation, where the staff come up with new better ways of solving problems – the organisation can be thought of as self-regulating
- In the open type: the organisation makes use of both internal and external resources to innovate their products – in the mode of innovation the process itself can be affected from multiple sources such as the customers, suppliers, competitors and even the moral or political leanings of its employees.

As can be deduced from the information presented, the two types of innovation are better suited for different environments. For example in an organisation where collaboration is encouraged, an open approach to innovation would be best suited. However, with an extremely open environment there is a risk that the product an organisation is developing may also become known to their competitors.

According to Chesbrough (Chesbrough, 2003) the two approaches to innovation can be demonstrated schematically using the following diagram:

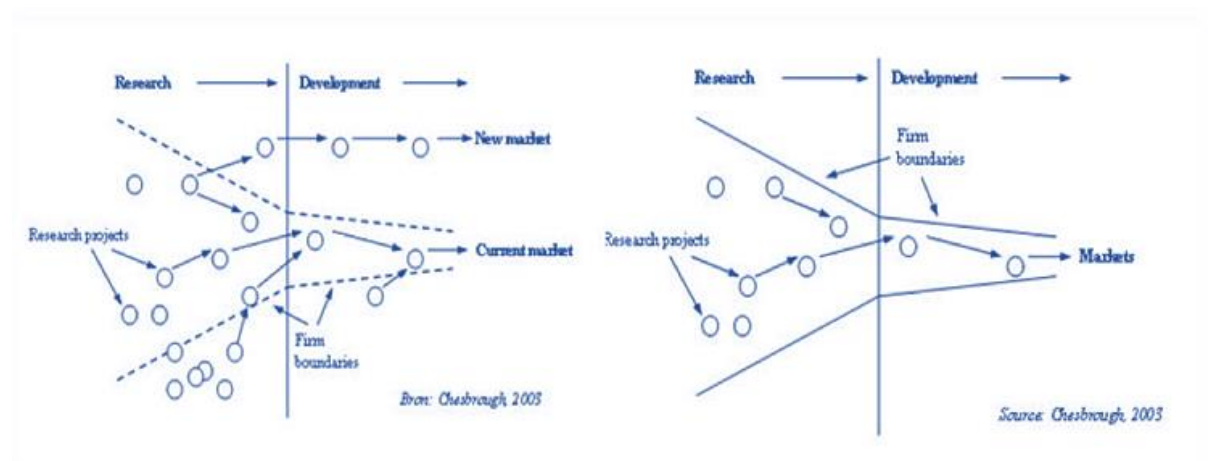


Figure 2 – Open and closed research and development cycles – adapted (Chesbrough, 2003)

As can be seen in the figure above, in the open system to the left ideas and innovations can be allowed from both within and outside the company boundaries. However in a closed system a strict set of rules has to be followed which ultimately may lead to lesser opportunities from the development process.

A closer look – closed system

As mentioned before, in a closed system the innovation is developed by the companies themselves. This involves all aspects from the creation of the product idea to marketing and sales and all of this exclusively happens within the company and using the knowledge available to the staff of the company.

Therefore, opening up the companies ideas to outside is not possible within this development mind set/framework. One of the benefits of using a closed source for innovation according to Mutlu (Mutlu, 2013) is that it allows full control of the end product to the company that spent its resources developing the product and in this sense has less to worry about competition.

However the downside of this closed approach is that the organisation will inevitably be required to invest large sums of money, time and other resources to achieve a good level innovation.

In a closed system because innovation has to come from within the organisation this also puts a lot pressure on the employees of the organisation to always be on the cutting edge. When hiring new employees the managers also need to make sure that they hire the better candidates to maintain the current level of innovation – and this of course, makes closed innovation much more expensive due to generally higher salaries of the experienced employees

A closer look – open systems

And open system in the broader terms means to open up the development and research process to sources of knowledge and innovation in areas outside of the company boundaries. In this way, innovation is created through the mixing of knowledge resources both internal and external to the company. This means that in an open system it would be acceptable for the employees of the company to discuss and share their work with their users in public forums, with universities in possible research sponsorships or partnerships and in some cases even collaborate with their competitors to develop a product that is superior to what any company could achieve individually.

However, it should be worth noting that collaboration with other companies and using open sources of knowledge in an open innovation system can still incur some costs. For example, according to Kamien (Morton I Kamien, 2002) there can be some significant costs associated with using intellectual property developed by others for commercial purposes. The main benefit though is that the knowledge from which innovation is derived already exists in the market and it's simply a matter of getting the correct permission to use it instead of trying to figure it all out – which can often lead to failure.

A brief summary of the principal differences

We can summarise some of the main aspects of the two types of innovation discussed in the following table.

	Open innovation	Closed Innovation
<i>Company philosophy</i>	Grab the best ideas, regardless of the source of that idea being internal or external to the company	Good ideas come from within the company derived from its well trained employees and other knowledge resources
<i>Company boundaries</i>	Ideas and knowledge about innovation can be exchanged, largely freely, with the outside world	Ideas and knowledge generated by the research and development team stay confined within the company – not much knowledge is shared with the outside world
<i>Main function of the customer or user</i>	From open collaborative platforms such as user review and feedback websites the product is refined constantly	Customer / user is viewed largely as someone who passively receives and accepts the end product
<i>Source of capital</i>	Generally not a large capital is needed at the start – thus many software startups preferring this mode of innovation	Requires significant starting capital, both in terms of human resources, infrastructure and knowledge resources – this generally only used by companies that are already very large

<i>Skill and knowledge of employees</i>	Bright people from both within and outside the company can be called upon to help develop a product	Employees need to be highly skilled to able to continuously generate innovative solutions in a closed environment.
<i>Importance of good ideas</i>	It places greater importance on making good use of available ideas in the open market	Good ideas need to generated from within the company and then be correctly applied
<i>Value of intellectual property</i>	Intellectual property created by others are available and can be used to create new products or build on top of existing products	Outside intellectual property is not welcomed. But this also limits the cost of having to license intellectual property from external sources.

Table 1 – primary differences compared between two modes of innovation – adapted Whittington (Richard Whittington, 2011)

Hypothetical examples

Lets use two hypothetical examples here, an organisation developing tools for the government or the military or any other highly sensitive area, they would have to keep all their innovation secret to avoid their product ending up in the wrong hands and as such a closed approach to innovation would have to be adopted.

On the other hand, an academic researching on some characteristic of human behaviour would benefit greatly by having access to information and research done by others – without this access to an open innovation environment the academics work would be particularly difficult.

In todays markets, according to AlMarzouq (Mohammad AlMarzouq, 2005) in particular the digital economy, focus is ever more given to open source and collaboration because it allows entry into the market at a low cost comparative to the old way of doing things.

Innovation at Stockholm Gases

With that brief explanation of how innovation works we can say that the company in our case study doesn't necessary need to adhere to a closed innovation system – however, in reading the meeting conversations there is not mention of using information from external sources in their development process beyond the initial discovery that others were attempting to do this.

During their managers discussion there is a lot talk about how it should be marketed and what audience to target but actually very little talk about the research and development process it self – I will come back to this point further down in my report when I make a recommendation on the investment.

In the remainder of the report, instead of focusing on the definition of innovation we will give more attention to rather how it is used and its benefits.

Product development stages in the case study

Who does what in what stage?

In the meeting in the case study there are four people mentioned by name, their roles varies from research and development leader, product manager, licensing manager and the marketing manager. There is mention of dental scientists and business development staff – but these are not mentioned by name and as such their roles are cannot be very well determined from the case study. For our study, lets take the research and development managers role and explore it further.

From what can be deduced from the case study is that he has a technical background and may be responsible for some of the engineering teams researching and designing the actual device. As such he would have first hand knowledge of the capabilities and limitations of the product – this is, he would have very good individual knowledge on how the plasma toothbrush works.

Although not explicitly stated in the case study, a research and development manager's duties also often include planning and making sure the plans are followed through within their organisation and oversee the stages of the plan to make sure adequate quality is provided.

He would also likely have a very solid educational background having perhaps a masters degree in engineering as described in the general skillset of a research and development managers in (Maximilian von Zedtwitz, 2002).

What would be his role and responsibility within the project?

As stated in the case study meeting, he is responsible for keeping on top of all the gains made by the research and development team and present this in a simple format to the other stakeholders within Stockholm Gases – in this case the other managers involved in the investment decision process.

He having a background in engineering is also likely to do some of the research himself to primarily be able to give direction to his other research and development team members.

He is also likely to have more years of experience in research and development than the other engineers and scientists working in his team so this also gives him the opportunity to transfer a lot of his individual experiences to the team by discussing issues with and socialization and group learning to organisational knowledge.

Organisation knowledge as described by Tsoukas in (Vladimirov, 2001) as the knowledge that exists within the organisation, not necessarily within each employee's mind, but information that is available to a large part of the relevant departments within the company. And this is where an experienced research and development manager can make contribute greatly to the company.

The general concept of transforming individual knowledge to organisational knowledge can be briefly summarized and displayed using the following figure.

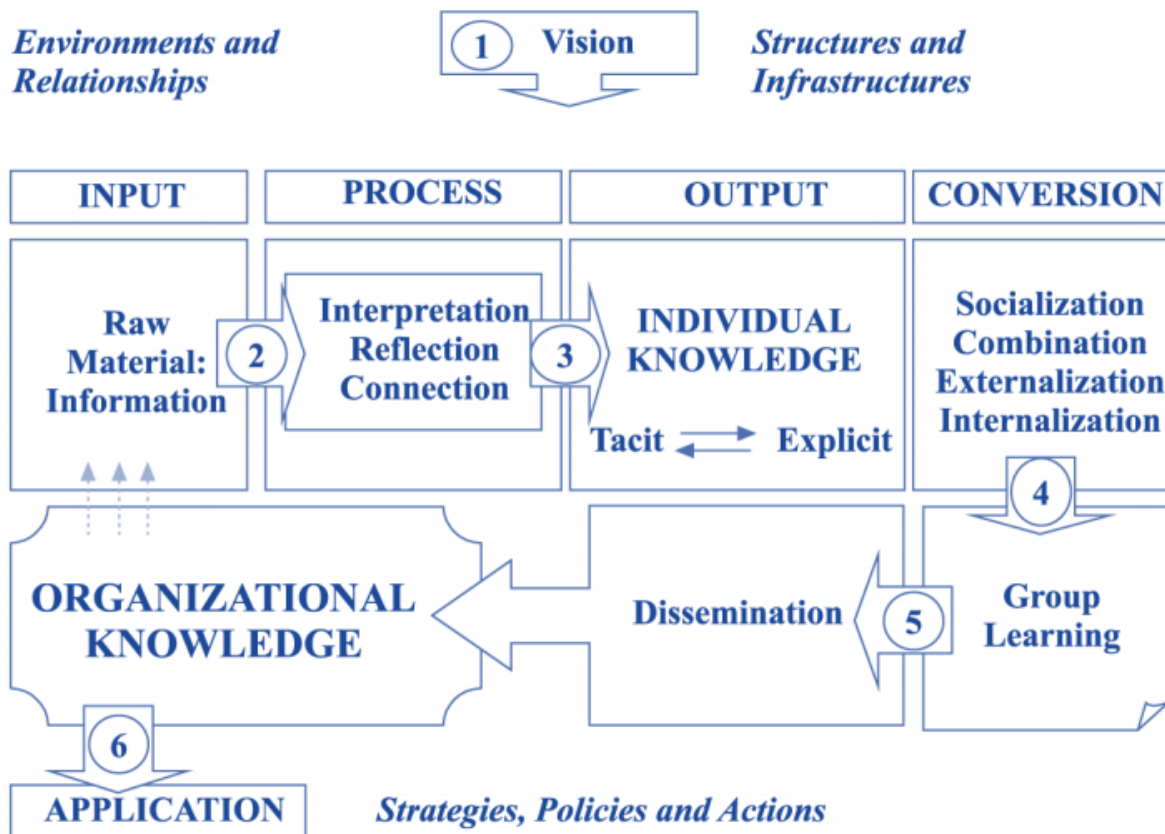


Figure 3 – Transitioning from individual knowledge to organisation knowledge – adapted (Lustri, 2007)

According to Lustri in (Lustri, 2007) the 6 main stages in which individual knowledge get transformed into organisational knowledge are:

- 1 Deciding on a route to take for the project at hand and sharing with the rest of the team the purpose of knowledge development
- 2 Gathering the information necessary to be shared for the success of the project – this is done on an individual level
- 3 Reflecting critically on how the information should be contextualized for the group to make best use of – this step would also be an individual step for the manager
- 4 Conversing with the team and turning the individual knowledge into group learning
- 5 Disseminating that knowledge from the individual to the local team and then onwards to other levels within the organisation
- 6 Lastly, when the individual knowledge has been disseminated enough across the organisation it starts to be applied in other projects

This is how the research and development manager could influence the teeth whitening project by sharing his knowledge and possibly creating avenues for employees from other departments from benefiting from the research and developments technical knowledge.

The balance of individual and organisational knowledge at Stockholm Gases

As an organisation Stockholm Gases have a large pool of organisational knowledge when it comes to gas equipment, specially in the industrial setting. However, from reading the case study it seems that not be the case for the consumer market and specially within the dental industry.

There are some members of the design team who have done some research into the consumer dental market. However given the limitations of the research taken over a short time and only by a few individuals, there may be gaps in knowledge and gaps in knowledge dissemination throughout the team that may lead to issues when going into more advanced stages of development (eg: production and marketing).

Relating this to the points we saw in the previous section, the organisation would have some difficulties in managing the knowledge necessary to successfully complete this project because they lack some key knowledge. And also, some critical knowledge regarding the new market are concentrated on a very few employees and if any of them left the company during the design process the setback would be quite significant – this all adds up to the investment risk.

Sources of innovation at Stockholm Gases

Before we jump into the case study at hand, let's have a review of the main sources of innovation. As a very brief description, we could according to Andrzej et.al (Skibiski & Sipa, 2015), summarise the main source of innovation in any organisation as the change that naturally occurs in the world and its effects on the organisation.

In class we looked at a few of the most common of such sources that can affect an organisation, among the ones covered in class includes:

- Laws and regulations set by the government or responsible authority
- Introduction of new disruptive technologies
- Changes in demand from the users of the product
- The organisation falling behind the products offered by their competitors
- Comparative analysis by consumers that show defects or lack of features in the product

Laws and regulations usually come from the government or responsible authority at the outset of an accident that involved the product in question. For example, according to Laura (Laura B. DeLind, 2008) laws and regulation for food stuff come after some disease has spread due to a lapse in existing regulation and this leads to changes in the law and ultimately forces industry to change the way it produces the food stuff going forward. It is very likely that there are many such regulations when it comes to personal hygiene equipment, specially ones that affect sensitive parts of the body, and thus the teeth whitening product is likely to be heavily regulated. However, there is no mention of this critical source of innovation in their meeting. It is partly implied in the research done by the research and development manager but is this initial research enough to invest millions of pounds in investment? We will come to this point later.

Regarding new disruptive technologies, the plasma teeth whitening machine would itself be disruptive as it has never been seen before in this industry. As defined by Clayton M (Clayton M Christensen, 2015) disruptive technology is one that significantly outpaces other existing innovations in the market and produces new value for the users and the businesses involved in this way. How disruptive innovation can be observed is demonstrated in the following diagram.

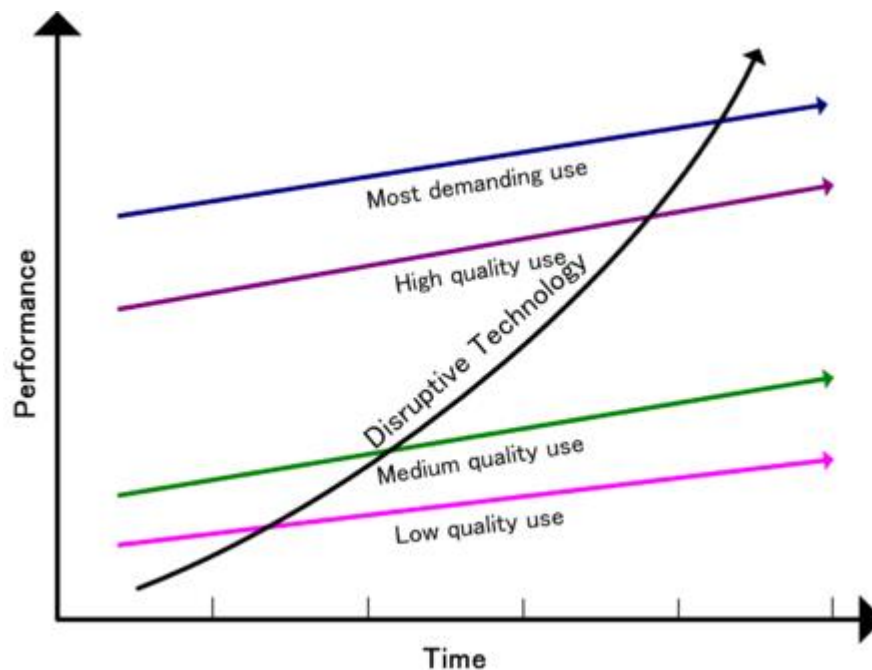


Figure 4 Disruptive innovation vs the rest of the innovations

And is if the design team do their jobs really well, the plasma teeth whitener may in fact be likely to cause other companies, such as the giants discussed in the case study to rethink their strategy. However, an organisation that is the disruptive creating in the disruptive innovation in the market can not necessarily use disruptive innovation as source for its own innovation.

With regards to changes in customers demands, it usually comes in the form of advice given in online forums and product review pages that users may contrite to. A good example of this would be social media websites such as youtube where people often make video reviews of products they use and how well they function, alternatively there are websites such as trustpilot where users review whole companies at a time on the quality of their products. As stated by Mailinen (Malinen, 2015), online forums are a great way to community feedback for the maintenance of a product, including and possible innovations that the users would like to see implemented. With this stated, Stockholm Gases could spend some time researching people opinion and reviews on the high end toothbrushes, against which the plasma whitener would ultimately be competing with.

Using online sources of information, an organisation such as Stockholm Gases can also keep itself updated on the products made by its competitors during the development and production stages and use the new information as a source of innovation in the design – making changes as needed to the ongoing project to make sure that it doesn't fall behind the completion in the time it takes from conception to delivery.

Example of how sources of innovation can change depending on industry

Not all organisations procure their innovative ideas from the same source and not all of them will have equal weighing when two opposing innovation ideas are presented.

In research carried out by Skibinski et.al (Skibiski & Sipa, 2015) they looked at how innovation affects the agriculture industry and found that above all other sources of innovation, user demand and reviews/opinions were the highest factor, followed by the costs associated with the manufacturing process. And at the very last on their innovation sources list is user the direction decided on by the organisation. This is shown in the following diagram.



Figure 5 – Differences in the sources of innovation – adapted (Skibiski & Sipa, 2015)

Real world compared to Stockholm Gases?

Going on from the data given for the agricultural sector we can make some general assumptions based on everyday experiences: that user feedback, input, comments, etc are the most important source of innovation in today's markets.

This intuitive belief is also strengthened in work by Norbert et al (Norbert, et al., 2017) where he connects that having users give feedback on things that work and things that don't in an open environment, it gives competitors a very easy way to see where they can improve and this leads the original organisation to double down on their development effort to retain the customers. This openness is great for innovation and customer service he argues.

With this much attention given to openness and customer feedback, we may ask ourselves how many times has customer need or opinion have been mentioned during their meeting? They are basing the project almost entirely on the ideas and goals of a few managers within Stockholm Gases. In my opinion, this is a bad decision they have taken.

My recommendation

Given all the background knowledge about sources of innovation and how they all relate to Stockholm Gases we can now make some conclusions about the benefits of this investment going forward.

It should be stated that all the information in the case study was brief and many details were not explicitly stated, thus many of my conclusions are derived from my interpretation of how they were planning on doing things. My interpretation is also based on the common trends in innovation that I found while researching for this report.

Innovation

Regarding sources of innovation, the whole project is slated to be a closed system. Judging from the tone in the meeting as described in the case study and the general practice for large companies (again, implied by the case study) is that their intentions, although not strictly stated, is to do all the work in house. They do at a point consider patenting the work done so far and collecting the licensing revenue from that, this would still classify it as a closed mode of innovation since all the development was done in a closed system.

In the field of industrial and commercial gas equipment Stockholm Gases is no doubt an established name and could very well successfully carry out a closed mode innovation, I think this may not be directly applicable to the proposed business in the dental industry where many things are different, eg: regulations for customer safety, customer needs and wants, competition from companies they have not faced before, etc.

On top of this, all of the companies knowledge regarding the teeth whitening product is concentrated in the few employees who participated in the early stages of development. Given that this is a completely new market and compounding that, they plan on introducing a completely new and novel product to the market, relying on such a small knowledge base may be a bad investment decision.

As we discussed in the chapter regarding the research and development managers role and how he could train the rest of the company to benefit more effectively from his knowledge, this would take time and other resources to accomplish.

What may be better?

From what I have observed so far, for a company planning on entering a new market it would be best to develop their product in an open innovative environment. It is likely that some of their technical knowledge regarding plasma toothbrushes may leak to their competitors but it would reduce the upfront cost of investment significantly.

They may even look to partner with some of their possible competition such as Colgate to draw from their knowledge on the dental industry and thus assure that they do indeed deliver a working product to the market on their first try.

We have seen examples in the past when a large company tried to completely revolutionize an industry with a novel product and failed completely – the Google glasses are a great example of this as per this article by Forbes (Altman, 2015).

What to do with the 10 million investment?

As we have seen so far, from my investigation it seems that the development and innovation approach Stockholm Gases are proposing is not the best for this type of product.

First timers in a field that deals with people health should take extra precautions to avoid hurting anyone with a bad product and from what was presented, Stockholm Gases do not have experience needed to develop devices for human care.

I would recommend against making an investment in this particular project, unless there are changes in the development and innovation modes.

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