Chapter

How to Deal with Quantum Leap Innovations and Free-Fall Situations

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Abstract

When a quantum leap innovation enters the market, other competing companies can get in negative chaos and free fall situations for their businesses. To change such a situation, the use of controlled self-organization principles, for example, as prescribed by the Planetary Organization principles, can be valuable. This chapter, which is based on dynamic/flexible/agile philosophies and participatory action research from three industrial cases, mainly deals with the question how to develop quantum leap innovations and how to survive free fall situations. For both situations, creativity, improvisation, and dynamic development are essential ingredients for success. The chapter also gives some useful tips on how to successfully handle change management situations.

Keywords: innovation, dynamic principles, organization, planning methods

1. Introduction

"Innovation" has become almost a buzzword that has no one single definition of what it means. In general, it is a positively loaded term that brings hope in difficult times for actors in the private sector, the public sector, and the idealistic (nonprofit) sector as well as for whole economies.

However, to create successful innovations is complex and often influenced by unforeseen possibilities and situations as well as problems to overcome for which no known solutions exist. Even more unclear is how to develop "sustainable innovations," although we might have an intuitive feeling that the expression refers to developing something good for the society and its inhabitants.

This paper deals with some experiences from three practical innovation projects. All three cases were successful although the development was not as smooth as wanted or wished. The findings are highlighted in this paper.

2. Research

The paper is based on participatory action research (PAR) [1] from three industrial cases with three start situations: the development of SKF New Products (SNP) and the business unit FlexLink, the development of a new product of Careva system AB based on an invention, and the change management of Frontec Research &

Technology AB (FRT), which was a business in free fall. SNP was a subsidiary of the multinational ball-bearing company SKF AB. FRT was a subsidiary of Frontec AB, which was noted on the Swedish exchange market. Careva AB was a small Swedish privately owned company.

3. Theory

A practical definition of "innovations" is that they are new products (meaning goods and services) that are sold and used [2]. In this view, a new product or an *invention* is not an innovation but a part of it. "Sold" here means a wider view and money does not need to be exchanged. A new innovation can also be a new organizational method in business practices or workplace organization.

One often distinguishes between three main innovation types (*incremental innovations*, *radical innovations*, and *survival innovations* [2]), and the most common type of innovation seems to be the *incremental innovation*, meaning the continuous development of products and services as well as business models and also organizational settings until a disruption situation occurs (see **Figure 1**), often initiated by a competitor in the market. Lean product development is one method to successfully make continuous improvements of existing products and solutions. When a disruption situation occurs, there will be a free fall to a stop or a new opportunity to develop based on new knowledge or a new solution. This is sometimes called a *quantum leap* [3]. The free fall means a negative chaos, while a positive chaos and a euphoric feeling often occur when a completely new opportunity appears.

Note that the curves in **Figure 1** are not smooth in real development projects, which can also be seen from the cases described below.

Radical innovations appear as sudden steps up in the development level, sometimes called quantum leaps (see **Figure 1**). They are based on knowledge breakthroughs that are developed and introduced in the market. The technical development content is initially often large, and the organizational and business development comes after the introduction of the product on the market.

"Survival innovations" are needed for an organization when a radical change is needed for the business to survive. It can happen when a sudden step-down occurs (see **Figure 1**), for example, because of new laws or environmental changes, or when a market drop occurs for the business. This can be the result of competitors

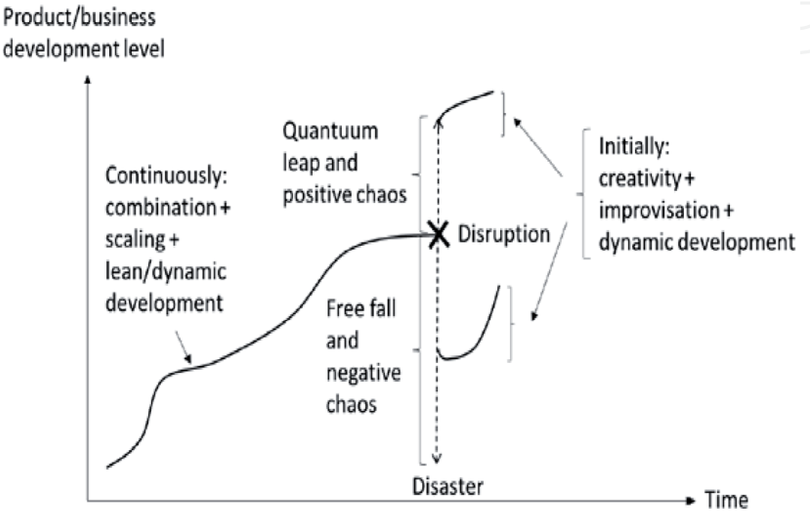

Figure 1.
Situational innovation (product and business) development [4].

introducing new technology and/or marketing and sales principles. In such a case, the technical development content is often initially small, and to improve the situation, focus must be on organizational and business development issues.

To coordinate all activities in the development of an innovation is a complex management activity for which some parts can be planned and for which *creativity* and *improvisation* are needed when it is not possible or meaningless to plan in depth.

"*Creativity* means shakings things up, both inside ourselves and in the world around us, and the constant re-organizing of both cognitive schemata and, to a greater or lesser extent, the domain of the creative person's activity" [4].

"*Improvisation* is thought of as making the best of things, while awaiting a return to the way things should be done. Improvisation is an exception, something we can 'fall back on' when things do not go the way they should" [5].

Therefore, innovation management is different from the management of mature businesses. Also, innovation management is place- and situation-dependent: the culture in the organization and the geographical area where the development takes place and the market where the initial marketing and sales takes place.

The more complex the leadership situation in a region or country, the higher the demands to produce market sustainable innovations and the more complex the innovation management as well as their costs will be. Sweden is an example of a country with such a demanding management situation (see **Figure 2**). Although Sweden's population is only equivalent to 0.13% of the total world population, it is the 33rd largest export economy in the world and the 4th most complex economy according to the Economic Complexity Index (ECI). Another example is that, although the Nordic countries, especially Norway, have high labor costs with an average of 125 than the G7 countries of 108, they have managed to be successful on a global scale. "Therefore, there are important lessons to learn from high-cost countries that successfully compete in the global marketplace" [6].

In principle, there are three main types of management situations: to develop incremental innovations in existing companies that are managed by *project leaders* and managers, to develop more radical innovations managed by *entrepreneurs* and *intrapreneurs*, and to develop "survival innovations" managed by *renovateurs* [7]. The three innovations appear in all sectors: the *private sector*, the *public sector*, or in the *idealistic/nonprofit sector*.

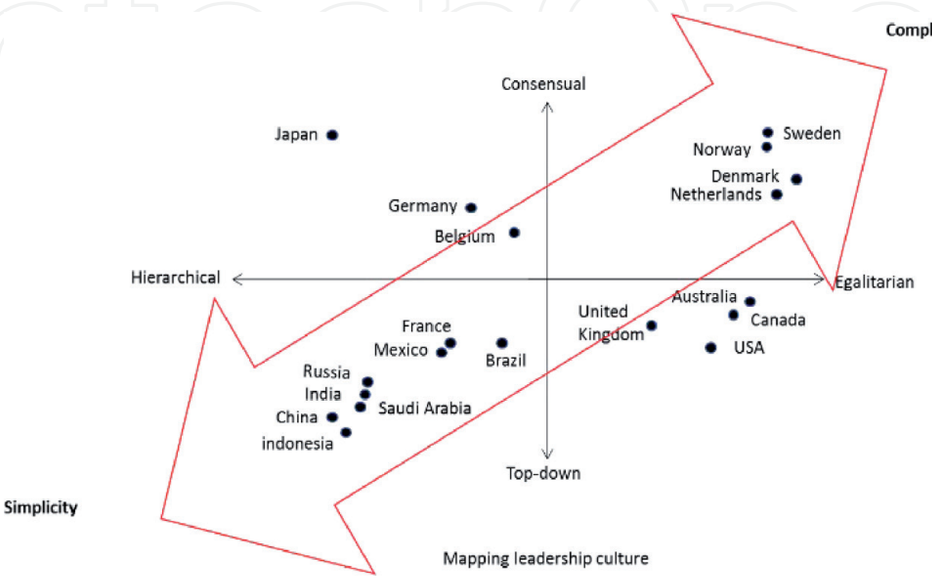

Figure 2.
Mapping leadership culture (based on [8]).

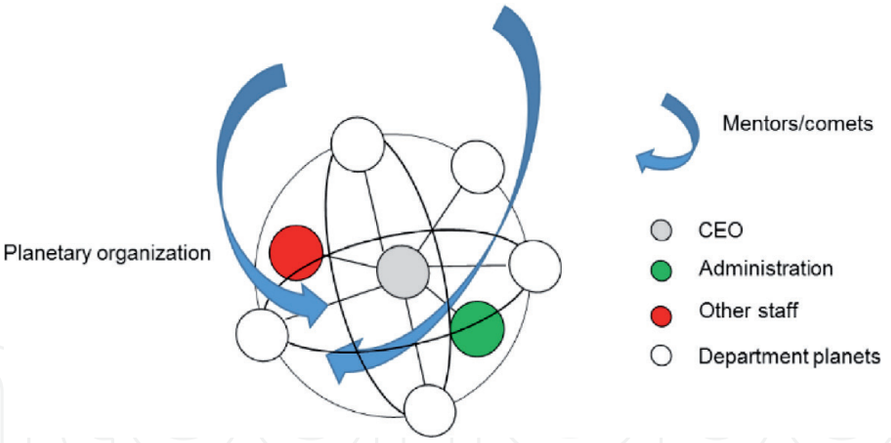

Figure 3.
Exercising dynamic leadership means to be present in the middle of the activities, allowing a controlled freedom in the team. In this case, the situation is pictured for a small- or medium-sized enterprise (SME) [4].

The classic view	The dynamic view
Small changes are negligible	Small changes can cause big differences
Linear—one best solution exists	Non-linear—many equally good solutions exist
Objectivity exists	The observer always influences
A small change in the initial conditions will not change the long-term behavior of a system	Just a small change in the initial conditions can drastically change the long-term behavior of a system
It is possible to make accurate long-term predictions about the behavior of the system	It is not possible to make accurate long-term predictions about the behavior of the system
Chaos is destructive	Chaos is the ground for development. Self-organization occurs out of chaos and disorder
A system is either stable or unstable	A system can swing between chaos and order
Organizations can be controlled/regulated	Organizations can only be influenced
One-dimensional up-down character (line organization with an order of importance)	Network character (Planetary Organization with more equality among its members)

Table 1.
Some examples of differences in view between the classic and dynamic views [2].

"Creative organizations should work out a model that would allow them to maintain a balance between non-hierarchical and hierarchical interactions, associated with equilibration and disequilibrium, or hierarchy, respectively" [9]. The Planetary Organization [10] seems to meet that demand well. This organization model can be seen as a combination of common line organization and self-organization. It was designed to take care of both vertical and horizontal communication and fast feedback, as shown in **Figure 3**. The leader is in the center of the Planetary Organization, giving energy to the other "planets." There are also "comets" which move freely in the Planetary Organization. The Planetary Organization has similarities with network organizations. However, they are more informal in their structures and are not thought to be something to use to actually organize an organization.

The Planetary Organization plays an important part of the Dynamic Product Development (DPD™) principles [2]. In turn, DPD™ is philosophically based on a dynamic view from quantum physics, chaos theory, and complexity theory, while the classic view—as Waterfall principles—are based on Newtonian mechanics, Taylorism, and the bureaucratic school. Some differences between the two

	Agile software development	**Lean product development (LPD)**	**Dynamic product development (DPD™)**
Background	Best practice	Best practice	Best practice + theory studies
Theoretical support	No theoretical foundation	No theoretical foundation	Quantum physics, chaos theory, complexity theory, innovation theory
Main research methods	Case studies (interviews)	Case studies (interviews)	Insider action research
Beneficiaries	Users, business	Customers, business	Users, business, and society
Leadership	No formal leaders	Management by wandering around (MBWA)	MBWA
Manning principles	Teams set up first	Teams set up first	Successive manning
Decision principles	Late final decisions	Late final decisions	Early preliminary and late final decisions
Location	Colocation	Colocation	Colocation
Work principles	- Iterations - Incremental steps - Frequent tests	- Iterations - Minimize waste - Quality assurance - Value streams	- Universal design - DFX order - Iterations within and between incremental work packages - Traffic light metaphor - Rules of thumb (e.g., BAD-PAD-MAD-CAD, flowing water principle, switch between topics, (e.g., to reduce waiting time, apply the Pareto principle), few demands to meet in each loop, and so forth)
Follow ups	Weekly meetings Performance, time (PT)	Weekly meetings Quality, cost, time (QCT)	Weekly meetings in the war room Performance, cost, time (PCT)
Comparing scientific studies with other PD methods	Nothing found	Nothing found	Yes, from hardware development, software development, and organization studies

Table 2.
Some important characteristics between three dynamic development methods.

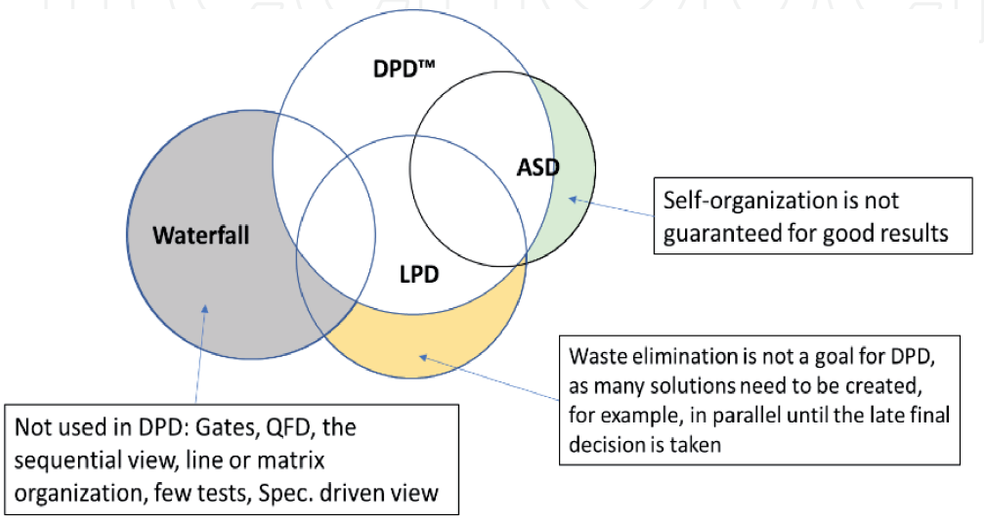

Figure 4.
Relations and differences between different development principles.

philosophic views are shown in **Table 1**. As shown, there are fundamental differences between the two views.

However, the dynamic view is gaining ground, for example, in Agile software development (ASD), and from there it starts to spread to hardware development (e.g., [11, 12]). Based on information, mainly from [2], comparisons can be made between different Agile/flexible/dynamic development methods (see **Table 2**). As seen in the table, there are many similarities between the different methods. DPD™ has more defined work principles and has a solid theoretical background, while the other methods are based only on best practice. **Figure 4** can be used to show the relationships and differences in a simple way. In that figure, the Waterfall principles included many principles that are also used in DPD™.

4. The three projects

4.1 Forming an incremental innovation

The Scandinavian division of the multinational SKF AB [13] decided to start SKF New Products in Gothenburg in 1979 as their volumes were decreasing mainly because of digital solutions. Therefore, a new start-up company was formed in their own premises in an old part of the SKF buildings, with its own board comprised of directors from SKF and two union leaders representing black- and white-collar worker unions. The author was recruited as an intrapreneur from another multinational company (ITT) for which he was responsible for the R&D laboratory in Stockholm. Before his appearance at SKF, 20 people from within SKF had been transferred to the new unit, mainly to work in one new business unit—SKF Actuators—and in an evaluation group of patents and product ideas. The treatment in this study is only about the evaluation group and what it accomplished.

One of the first decisions the intrapreneur made was to transform the evaluation group to the business unit, FlexLink, around an external prototype conveyor belt that the evaluation group was investigating. Having done that, the vice president of SKF AB told the intrapreneur and his staff directors that he had recently closed a business unit in Germany that worked with a similar product. On a direct question about whether he wanted the intrapreneur to also close this new business unit, he answered that it was up to the intrapreneur to decide on that. However, the staff directors ordered an external market investigation that showed a market and profitability situation far below the rules given for new businesses within the SKF Group.

However, the intrapreneur had experienced at ITT that market investigations for products that do not exist on the market are of limited value and that the entrepreneur/intrapreneur is of prime importance if a new product or service will be an innovation or not. The intrapreneur of SKF New Products had faith in the entrepreneur he had chosen for FlexLink and decided to act as an umbrella man sheltering his entrepreneur so that he was able to forget about company politics and to allocate all his energy into getting the new business unit running as fast as possible.

Next, there were many rules for the traditional business within SKF that had to be skipped, such as how business cards should look, the sizes of parcels for delivering the products, how marketing material had to be done, and pricing. Tricky questions included how the logo should look and if the logo should have the SKF mark or not and if FlexLink should have its own telephone lines. The intrapreneur of SKF New Products had learned that asking for permission was not the right way to proceed in the large ITT organization where employees simply did what they thought beneficial for the new business. The vice president of SKF, as well as different directors around him, did not consider it worth engaging in this small

business that probably would have to be closed later as had happened with the German business.

Today "FlexLink is a leading conveyor manufacturer offering automated conveyor systems, flexible conveyor equipment, aluminum and stainless steel conveyors" [14]. According to their home page it has:

- 989 employees.
- 30% of employees are women.
- 50% of employees have a university degree.
- Operating units in 30 countries.
- Partner networks in more than 60 countries.
- More than 8000 installations worldwide, many for leading brands within FMCG, healthcare, automotive, and electronics.

Before FlexLink was purchased, partly by a Swedish venture capital company and later by the ABN AMRO Bank N.V. in the Netherlands, SKF made a considerable profit from running the business and the shares, although it took some years for them to break even. Had it been closed down early in its vulnerable development stage, which had been the natural decision based on the German experiences and the market investigation, SKF would have missed the benefits from the business unit.

4.2 Forming a radical innovation

In 2003, Mrs. Evastina Björk, who is an occupational therapist, defended her PhD thesis [15] in which she proposed a solution of a universal positioning belt for disabled people being transported in taxis and other vehicles. She had created that solution in 2002 and had made simple tests on it. Tailor-made positioning belts and modules of belt parts that could be combined to be suitable belts for people of different body shapes existed, but she found that was not a suitable situation for public transport, and a wish had been expressed by London Taxi to create a universal system. The new product concept consisted of two belts that were crossed over the chest of the passenger (see **Figure 5**).

In mid-2003, the development of the concept as a commercial product was started by the small company, Careva AB, in Gothenburg. The author was contracted for the technical development of the product, for which he used the development method Dynamic Product Development [2]. Quite soon, the functionality level reached about 80% of what was stipulated as the functioning level for the product (see **Figure 6**). DPD™ as a method was not commonly known, and classical methods, such as integrated product development and variants of it were commonly used. However, for financial reasons, the project had to be put on hold for almost 1 year (2004). When new funding was found, the money was coupled with demands for using classical development principles and classical control demands. A new start, orchestrated by an industrial design bureau, took place with a result that was not as good. From August 2007, the author was brought in again, and dynamic principles were again used to achieve a ready and functional prototype, which was achieved in February 2008.

Many small problems and tests on a large number of disabled passengers were needed to produce a commercial product and not until 2011 could the product be

introduced on the market. From the homepage of Careva, the following information can be found:

"The Crossit was initially designed for public transportation such as taxis, busses, trains or aeroplanes, as the design allows someone who does not use positioning support but who wants to sit in that location in the vehicle to do so without removing the belt. It was designed to stay in place. However, after its introduction onto the market in 2011, the Crossit has also become popular for use in family cars.

Crossit has also been tested by users who employ a wheelchair, and it has been found to fit all wheelchairs with a sturdy backrest. It is especially suitable for elderly people who require posture assistance, helping them to achieve an upright sitting position, or for people who need extra support in a power chair. No tools are required for installation in a wheelchair or in a car seat. It does not cause any damage to interior of the vehicle."

Figure 5.
The principle of the Careva Crossit positioning belt [16].

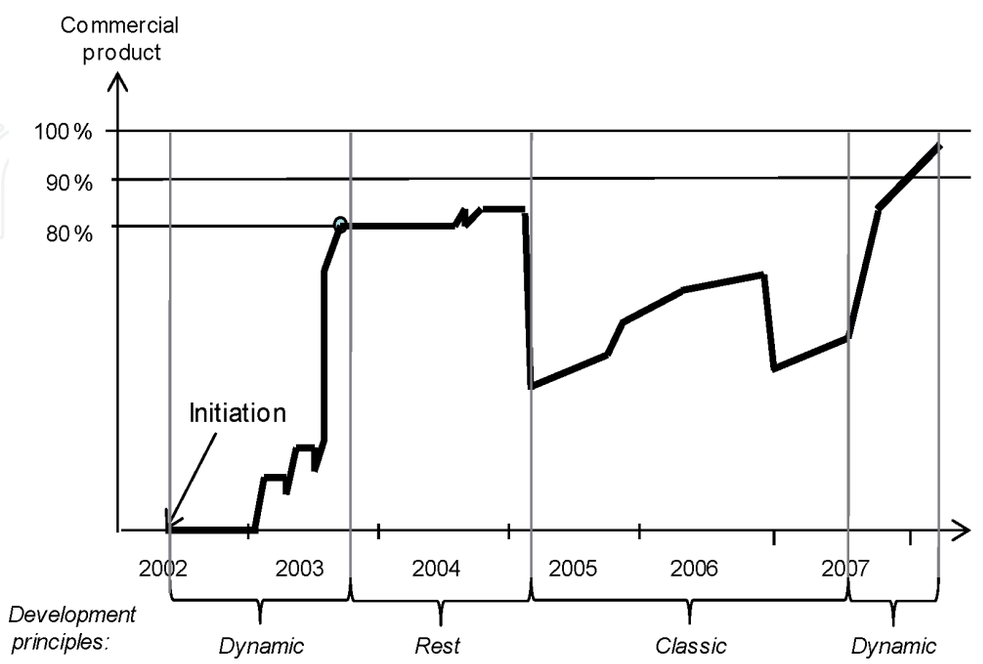

Figure 6.
The development of the Careva Crossit product [17].

To date, Careva exports the product to all the Nordic countries and several other countries around Europe.

4.3 Forming a survival innovation

A turnaround project was to bring Frontec Research & Technology AB (FTR) in Gothenburg, Sweden, to a profitable position within 6 months at an undefined cost payed by the business' own income and with support from the mother company, Frontec AB. Discussions between the chairman of the board and the author about such a project started in December 1999. Prior to that, the mother company had tried traditional ways to change the negative curves without success. The discussions ended with the author being given the mission, as interim CEO and renovateur, to turn around the company. If he should not succeed, it was determined that the company was to be closed down.

When the project started, FRT had 125 qualified employees. It made a loss of about 900.000 SEK (about 90.000 USD) per month and had done so for the last 6 months. When the negative trend had started about 1 year earlier, different experts were consulted to change the situation. In early December 1999, the CEO had decided to leave the company, so the mother company had to try something radical to change the situation.

The renovateur got a free hand to do what he thought best, without having to ask the board of the company for acceptance. Monthly financial reports had to be delivered to the mother company, which was noted on the Swedish exchange market. The renovateur started to plan his work in January 2000, although the formal start as deputy CEO was on the 15th of February 2000.

The change management/turnaround project started with the reshaping of the company to be a Planetary Organization, with the sun in the middle (the author/CEO), moons (the departments) in orbits around the planet, sub-moons (the groups) orbiting around each moon, and comets (free specialists) who moved freely in the Planetary Organization. Dynamic management principles and methods were introduced and used to speed up the changes needed to transform the company to a profitable enterprise (see [1]).

At the start of the project in February 2000, the company had no commercial value. Four months after the project start, the value of the company was calculated to be 32–44 MSEK or ca 3, 5–5 MUSD [18], and the company was sold in autumn 2000 to another company on the Swedish stock exchange—Sigma AB.

The combination of the Planetary Organization concept and the use of dynamic methods and principles were powerful in quickly getting the company to show blue figures, after its situation with heavy red financial figures. The activities specified below were especially important to improve their results:

- A "stripped-down" monthly financial report as a complement to the formal one for the mother company gave the CEO better possibilities to see how the core business was developing.

- An "early warning system" was introduced to take away unwanted surprises.

- The individual bonus system was changed for the managers to be a collective bonus system.

- Continuous improvements (lean) and the Pareto principle were used intensively.

- Management by MBWA was critical to pick up on weak signals and to improve the mood of the employees. MBWA also made it possible to meet the not confirmed bad rumors in a sophisticated way without revealing knowledge of the rumors.

- The three "comets" increased the efficiency of the work, based on storytelling and mentorship.

- By encouraging the consultants who were working at the premises of the customers to suggest small improvement projects and get feedback from the customers, the sales increased.

- The risk level for the company was lowered as each of the managers got to know the other managers' duties, activities, and situations meaning that they could better support each other and even take over their jobs in case of planned and unplanned situations.

A pure line organization was used before the change in management started. Very few of the actions carried out could have been accomplished without difficulty if self-management alone had been used. As there were people working against the changes while officially saying they were in favor of the new ways of organizing and working, they would have hampered success of the activities if pure self-management had been used. Based on these experiences, it is hard to see how self-management, a circular and/or a holacracy/holocentric/circular/sociocratic organization [19] could have been used to obtain the results achieved in this case.

5. Discussion

The three, with PAR [1] investigation, projects showed that the dynamic principles and especially the use of DPD™ gave successful results.

The first case—SKF New Products—shows some of the difficulties an intrapreneur has to face. In this case, the good thing was that the management of SKF did not believe in the business unit, FlexLink, so they did not care that the intrapreneur broke a number of company rules, such as forming a unique trademark and developing suitable marketing material for the business and its products.

The SKF case showed an innovation that was developed into a mature, sustainable, and growing business. The case shows that it was extremely vulnerable and needed to be taken care of in a very sensible way, getting shelter, care, and nutrition offered by the renovateur and using its own localities. **Figure** 7 shows, in hindsight, the fruitful situation that was created for the large organization to take care of its lean and innovation activities living side-by-side. The innovation business in the figure is SKF New Products, with its different innovation projects organized as planets. The business units of SKF New Products remained in its own premises for all innovation projects until they had grown so much that they needed to move to new premises.

The SKF case also shows that market investigations for new products can be disastrous for deciding on whether further development should be done. A "good" entrepreneur will find his/her ways to success.

The second case—Careva—shows how tricky it can be to create to a commercial product and that product development can be far from the linear and nice looking S-shaped curves common in the literature.

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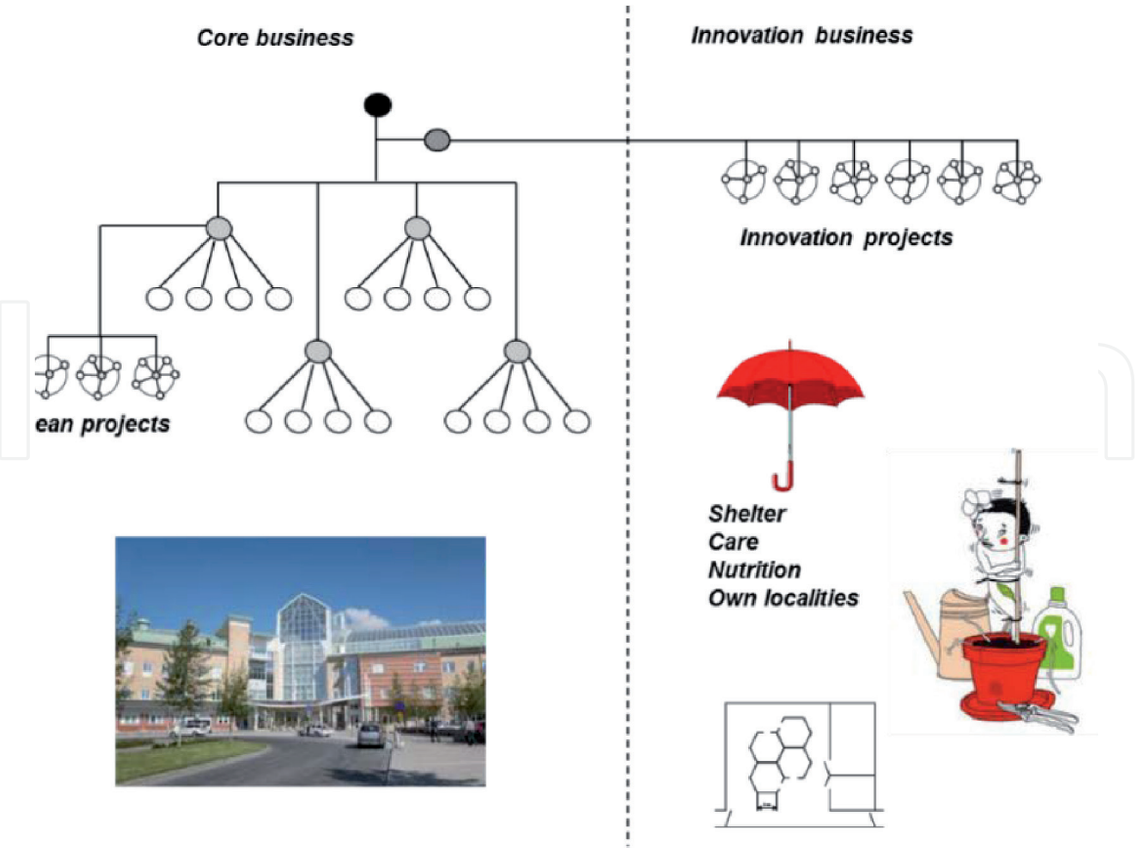

Figure 7.
Lean projects can be handled in the core business, while innovation projects is best taken care of outside the core business [2].

The third case—FRT—shows that Planetary Organization, in combination with dynamic methods, can give extraordinary results. Based on our experiences from the project, it can be concluded that neither the line or matrix organizations nor self-management organizations such as circular, holacracy, holocentric, or sociocratic are suited for handling modern, complex societal demands and fast-moving changes. The Planetary Organization accomplished this.

To determine whether the findings from the FRT case can be generalized, more projects need to be done and followed up. This is especially important, as traditional management methods and techniques are not designed to handle instability and rapidly changing situations.

6. Conclusion

The three principally different situations shown in **Figure 1** can be useful to have in mind when deciding what kind of organization, planning principles, and development methods should be used to get a wanted result in the end.

The three investigated innovation projects are examples of the fact that neither linear nor nonlinear curves can be used for the planning of new product development and innovation development activities. Often, only creativity and improvisation can push the development processes further when problems occur.

One conclusion is that product and business development based on satisfying a *need* and *a want* can be planned with traditional methods. Development based on satisfying a *wish* and a *want* can only partly be planned with traditional methods. In addition, creativity, improvisation, and the use of dynamic principles are needed to achieve successful innovations.

Entrepreneurship was shown, in these cases, to cover not being "politically right" and daring to take risks to break against accepted rules and opinions to be successful in the end.

All three development projects resulted in sustainable businesses.

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References

[1] Ottosson S. Participation action research—A key to improved knowledge of management. Technovation—The International Journal of Technological Innovation and Entrepreneurship. 2003;**23**:87-94

[2] Ottosson S. Developing and Managing Innovation in a Fast Changing and Complex World: Benefiting from Dynamic Principles. Vol. 2018. London: Springer Nature; 2018. ISBN 978-3-319-94045-8. 350 p

[3] Hamm S. Bangalore Tiger. New Delhi: Tata MacGraw-Hill; 2007

[4] Ottosson S. Three innovation development cases with three starting and performance conditions. In: ICBIA2018: 20th International Conference on Business Innovation and Applications; 20-21 August; Barcelona Spain. 2018

[5] Montuori A. The complexity of improvisation and the improvisation of complexity: Social science art and creativity. Human Relations. 2003;**56**(2):237

[6] Holtskog H, Carayabbus EG, Kaloudis A, Ringen G. Learning factories—The nordic model of manufacturing. In: Palgrave Studies in Democracy, Innovation, and Entrepreneurship for Growth. 2018. ISBN 978-3-319-41886-5

[7] Bjerke B. About Entrepreneurship. Cheltenham, United Kingdom: Edward Elgar Publishing; 2013. ISBN 978 1 78254 5385

[8] Meyer E. Being the Boss in Brussels, Boston, and Beijing. Harvard Business Review. 2017. Available from: https://hbr.org/2017/07/being-the-boss-in-brussels-boston-and-beijing, Retrieved October 2019

[9] Shkliarevsky G. Understanding the process of creation: A new approach. Journal of Sustainable Business and Management Solutions in Emerging Economies. 2017;**22**(3). DOI: 10.7595/management.fon.2017.0021

[10] Ottosson S. Planetary organizations. Technovation. 1998;**19**(2):81-86

[11] Schmidt TS, Paetzold K. Agilität als Alterative zu traditionellen Standards in der Etwicklung physischer Produkte: Chancen und Herausforderungen (in German). In: DfX-Symposium 2016; 05-06 October; Jesteburg, Germany. 2016

[12] Böhmer A, Grauvogl C, Schwiegert-Recksiek S, Becerril L, Bahrouni Z, Lindemann U. Towards agile development of physical products. In: 23rd ICE/IEEE ITMC, Madeira, June. 2017

[13] Available from: www.skf.se [Accessed: 14/03/2018]

[14] Available from: www.flexlink.com [Accessed: 14/03/2018]

[15] Björk E. Insider action research applied on development of assistive products [PhD thesis]. Magdeburg, Germany: Otto-von-Guericke-University; 2003

[16] Available from: www.careva.se [Accessed: 14/03/2018]

[17] Björk E, Ottosson S. Lessons learned from a want based NPD project. In: International Design Conference—Design 2008; May 19-22; Dubrovnik, Croatia. 2008

[18] Markkula, Engstrom. Företagsvärdering av Frontec Research & Technology AB (in Swedish). Retrieved from report to the board of

Frontec AB from SET-Konsulter AB in Stockholm. 2000

[19] Ottosson S, Björk E. Experiences with planetary organization. In: The International Conference on Business Case Research (ICBCR 2016); December 12-14, 2016; Hong Kong. 2016