Failure-Driven Innovation

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includes a preface by

Anne S. Huff
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Preface

by Anne S. Huff, Kathrin M. Möslein & Ralf Reichwald

Management research in general and innovation research in particular are obsessed with success. Learning from success stories or cases is at the core of most research projects and almost all of our teaching. Entrepreneurs, leaders of established organizations, government policymakers, foundation boards and others also focus almost exclusively on achieving success by building on success. Yet we all know from experience what a good teacher failure can be. As children we often want more than we are given or can easily achieve. We must explore, experiment and test what works; it is inevitable that we learn most from what does not work so that we can try again.

Failure is of course recognized in practice and research, but among grownups it is typically seen as a necessary but uninteresting precursor to what really matters: successfully bringing something new to market. The prescriptive advice to would be innovators is to tolerate failure: 'do not give up, get up and try again.' Policy makers, award givers, and society are urged not to stigmatize the loser because big winners often fail first.

This book in contrast puts failure at the center stage for understanding successful innovation. Failure-driven innovation emerged from the work of a five member team who were among 50 research fellows working under the roof of an initiative titled "Leadership for Innovation: Visualizing the Invisible" supported by the Peter Pribilla Foundation

The great "Failure Team" reporting in this volume includes Allen Alexander, Olivier Berthod, Sebastian Kunert, Torsten Oliver Salge and Anne L. Washington. The publication at hand summarizes their findings and opens our eyes to the potential behind often invisible drivers of the success that can follow instructive failure. The compendium has a modular structure and offers five different perspectives on the phenomenon, each beginning with a review of an important literature for understanding how innovations are achieved:

Allen Alexander reviews the literature on failure from the perspective of strategy and leadership. His first chapter delivers a sound picture of the role and organizational realism of failure in the context of innovation. It shows what it means to create a failure-tolerant culture that supports creativity and innovation and suggests further readings on failure as a teacher or driver for innovation. The cases of "very PC" and "Magna CNC" provide a vivid illustration of the valuable learning from failed innovations.

Olivier Berthod looks at failure-driven innovation from a network perspective. His review of the literature reveals how deeply research on networks, collaboration and innovation are intertwined, but equally suggests that we do not know much about how networks react to failure in innovation. The case studies "Urgency" and "Wakes of Innovation at the Field Level" illustrate the power of failure as a driver of transformation in collaborative efforts.

Sebastian Kunert offers a process perspective on failure-driven innovation. The literature review chapter points the reader to valuable facets of innovation process design, innovation process failure and innovation process management. The case studies "Waste(d) Idea Management" and "Mired in Projects" facilitate understanding of learning from innovation processes that fail.

Torsten Oliver Salge discusses the literature on failure-driven innovation from an organizational learning perspective. His review reveals a rich picture of how individuals and groups learn or fail to learn from failure. His case studies "Failing to learn from failure" and "Responding to local failure" also illustrate shortcomings and missing pieces of the puzzle.

Anne L. Washington closes the compendium by looking at the role of technology in failure-driven innovation. Interestingly this chapter looks at failure from the perspective

of coupling, disruption and agility. These concepts are explored in case studies titled "Virtual Failure: Never-Ending Government Technology Projects" and "When Innovators Leave: Internal and External Failure" both reporting on failed efforts to create shared data bases.

A particularly valuable contribution of this research is that it makes visible how well-known levers of innovation can and sometimes must be changed when failure occurs. We know that innovation requires leadership, for example, but Allen Alexander's case on Magna CNC shows a leader who steps down into an operational role to learn what has gone wrong and personally demonstrate what must be done in a new way.

Similarly, Olivier Berthod's review of the literature on networks and alliances from a failure perspective re-emphasizes the well-known contribution of networks to innovation but also suggests that they are important as "systems of failure absorption" which can be critical for surviving future risks from sources that are external to the network.

Responding to failure in a way that can be sustained involves not just change in ideas about leadership and collaboration, but also a change in the way we think about process. Sebastian Kunert points out that existing models of project management as well as innovation are too linear. Contradictions are inevitable as innovators necessarily move back and forth between stages that are more reliable in established areas of the organization. It is frustrating but not surprising that managers, especially higher level managers, tend to be wary. His cases illustrate how real and potential failure requires more incremental processes than desired by enthusiastic supporters of innovation.

In his review from a learning perspective Torsten Oliver Salge points to research that links human problems with attribution to long-term avoidance of failures. His health care case-studies illustrate how a 'culture of fear' and 'a culture of justification' perpetuate non-response to failure. While the literature suggests that some barriers can be overcome by routine error reporting and analysis, this section of the book points to the importance of dedicated and sustained leadership to break up failure tolerant systems.

Finally, Anne L. Washington's look at technology as interconnected networks of knowledge focuses on the extent to which technological elements are 'coupled' – or able to move together. Common wisdom suggests that 'loose coupling' is necessary for innovation but her examination of two efforts to coordinate data by agencies of the United Government points to failures that stem from not achieving enough coupling in complicated political systems.

It is fitting that the last cases in this volume illustrate that there is still much to learn from failure. Yet as reviewers we are strongly supportive of this volume because it points to the tangible gains that can be made from taking failure seriously. It also provides theoretical signposts for further inquiry by practitioners and academics that can light the way toward more successful innovation

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Failure-driven innovation from a Strategy Perspective

by Allen Alexander

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The role of strategy and leadership

Literature review

Background

Basically, failure is unpreventable, especially in complex situations and within complex organizations (Edmonson 2011). Particularly, avoiding failure in a volatile and uncertain world is not an option, but if failure is managed well, it can present a very valuable opportunity (McGrath 2011). However learning from failure is not a new concept, Boulding (1969) presents failing as an unavoidable part of life and concurs that it can contribute to success if suitable lessons are identified and then learned. Shiv (2011) even suggests that failure can be an enormous innovation engine for an organization or an individual.

According to Edmonson (2011), individuals need an understanding of the types of failures and he presents three types. Firstly there are preventable errors in predictable operations, where solutions like checklists can be developed. Second, unavoidable errors in complex systems and unpredictable situations, in which a rapid identification and correction of small failures is essential. The third category of failure is the 'intelligent failure' which provides valuable new knowledge that can help a company to achieve competitive advantage and ensure its further growth. Often this kind of failure occurs when experimentation is utilized because the outcomes are not known or predictable in advance, because of the uniqueness of the situation which may never present itself again. On a similar theme, Sitkin (1992) characterizes intelligent failures as follows:

1. They are a result of sophisticated planned actions,
2. have uncertain outputs,
3. are of modest magnitude,
4. are conducted and responded to with enthusiasm,
5. take place in areas that are well-known enough to allow effective learning.

Finally, Edmonson (2011) exemplify the design of an innovative product or the creation of a radical new business as outcomes, which in themselves predicate intelligent failures of some order.

Organizational realism of failure

Keith Simonton, a psychology professor at the University of California, points out that many people, who are successful in innovations, have a churn out of a very large number of good and bad ideas, but they also tend to do the most failures (Shellenbarger 2011). In this regard, Townsend (2010) begs the question, why do innovative ideas often never becomes realized by the market? He then presents a number of reasons, but one of them is that employees never express or share their ideas (Townsend 2010) and all too often people worry that offering ideas up could be seen negatively (Valacich et al. 1994) or that ideas are just caused by penalties, themselves associated with failure (Townsend 2010). These worries are rooted at an early age, where people are programmed to think that failure is bad (Edmonson 2011). Tahirsylai (2012) compliments this by suggesting that such thinking begins with educational practices in the school system where there is almost no tolerance for failure, no risks encouraged and where only success is promoted. On a similar topic, Shiv (2011) describes two mindsets relating to the 'perception' of failure. His 'type 1' way of thinking presents a 'fear of making mistakes', which he suggests characterises the majority of individuals, managers and organizations today, particularly if you reference such influential business thinkers as Deming (1952), who captured the phrase "right first time, every-time" to represent Total Quality Management systems of error and mistake eradication. From early-on in a child's development failing is emphasized as being in some way painful and shameful, children start-out adventurously and with curiosity, but often in school this becomes suppressed and failures are not encouraged or tolerated, with

the result that people mould themselves into a type 1 model. In contrast, type 2 is afraid of not being successful, not attaining a goal or missing opportunities. To these people it is somehow shameful to sit on the sideline, where others run past with a great idea.

Husted and Michailova (2002) observed another reason why people do not openly share knowledge about their mistakes - the fear that colleagues could blame them or management could react by punishing the guilty. Related to that, McGrath (2011) states that failures often become non-discussable as employees are afraid of hurting their career prospects. Furthermore, there is also an emotional driver for not wishing to acknowledge failure, as examining mistakes in depth is an unpleasant feeling which can decrease self-confidence. Harford (2011) argues similarly that the perception of our self-esteem is inter-connected with failure. In this context, it is important however to realize that it is not the person that was the failure, just that they made one, but this is hard and Cannon and Edmonson (2005) reinforce this by stating that being held in high regard by others is an intense human desire and most people believe that confessing failure will endanger peoples respect and therefore their self-esteem. Goleman (1985) specifies this opinion stating that most people have an instinctive tendency to ignore, deny, disassociate or distort themselves from their own failures. As a result, people have a natural aversion to reveal or even announce failure publicly (Cannon & Edmondson 2005). Maintaining a high self-esteem is often associated with raising 'positive illusions of one-self' which are often unrealistic views of themselves, complimented by a control addiction to be happy and dynamic, but also to avoid depression (Taylor 1989). Nevertheless, avoiding failure boosts the sense of control and efficacy, which could become irreconcilable with an honest confession of failure and thus, while beneficial to happiness, can inhibit learning (Cannon and Edmondson 2005).

A survey conducted by Edmonson (2011), shows that only 2% to 5% of failures are truly blameworthy, but about 70% to 90% are treated as reprehensive by managers. That reflects the fact that many organizational cultures have little failure-tolerance which often leads to punishment (Cannon and Edmonson 2005). Simultaneously, it shows the behavior and leadership of senior executives that can discourage employees from identifying and analyzing failures and also hinders them from experimenting (Lee, Edmondson, Thomke and Worline 2004). Moreover, Wyman (2008) reports in his recent study of 293 senior executives, that more than a half complain about failing to create an open and supportive environment for an innovative business. In particular, 72% believe they are failing in the area of 'recognizing innovation' and 60% in the area of 'facilitation of idea generation'.

Creating a failure-tolerant culture

We know unarguably that senior leadership plays a crucial role in deploying not only the right organizational structure but also, more importantly perhaps, the right company culture and values to support innovative thinking. Similarly, Leonard-Barton (1995), Sitkin (1992) and Edmondson (2002) pointed out that organizational size is not a factor in terms of an ability to learn from failures. Supporting this, McGrath (2011) asked executives how effective their firm is at learning from failure, on a scale of one to ten. The response was often a meek 'two or three'. This indicates that senior executives are self-conscious in terms of failure and yet they make little effort to permit it, where even they try to hide mistakes. However, today's many management positions are held by people, who often take rules for granted and don´t challenge unspoken assumptions (McGrath 2011), when they become leaders. Also companies, that spend a lot of money in building up a learning environment, struggle with day-to-day business and efforts of learning from failures (Edmondson 2002). Recent anecdotal evidence presented

the authors with a reflection on a large, UK public sector organization who have acknowledged a disconnect between their 'lessons learned' phase of operational review, favouring instead two distinct phases of 'lessons realised' and 'lessons learned'. This suggests that they often realize valuable 'lessons' from failure, but perhaps find it harder to learn from these lessons.

According to Cyert and March (1963) however organizations are more likely to alter their behavior in response of failures, than in response of success and Bessant et al (2005) identify that in terms of organizational development phases, rather than a maturity model punctuated by time-intervals there is more a tendency for organizations to grow as a result of facing and solving a particular problem or crisis. Thus the prospect of failure stimulates and promotes behavioral innovation. Cannon and Edmonson (2005) argue that firms may avoid large failures by paying attention to small ones. Additionally, Kam (2004) argues that without a deepened and renewed understanding of failure, negative attitudes such as disregard and rejection are generated and reproduced. That compounds the negative perception of failure, followed by discouraging people in learning from failure.

Therefore Cannon and Edmonson (2005) pointed out that leaders need to establish an atmosphere of 'psychological safety' which helps employees to talk about what caused failures to occur. Edmonson (2011) specifies that the creation and the reinforcement of a learning culture is an essential condition where people feel comfortable for causing and learning from failure. From a practical perspective the development of operational quality measures, for example Failure Mode Effect Analysis (FMEA) is one way to explore failures, identify the mode of the failure and then once the effect is established identify ways to avoid it, or mitigate against the effects in the future. Analyzing organizational failures however requires patience, openness, and tolerance in an organization (Edmonson 2011), traits which are not

always at the forefront of many 'inspirational' and forthright leader's capabilities. In a similar vein, Townsend (2010) argues that a fault-tolerant corporate culture combined with strong decentralized decision-making creates more innovations. Particularly tolerance or even the celebration of failed innovations leads to a rising flow of innovation capabilities and a greater probability of success. On the one hand, such an environment supports a more direct innovation by supposing that all ideas have value (Townsend 2010), which was the opposite of earlier considerations about idea sharing in organizations (cf. page 1). Often the problem of ideas and their respective value can be overcome by shaping a process that ensures that all innovative ideas match the company´s present business objectives and support their current operational or business model (Christensen 2007). This is a early-stage achievement for harnessing innovation from organizations workforces in what Bessant (2003) entitles High Involvement Innovation. Managers in innovative companies encourage intelligent risk-taking and tolerate failure, but they also expect that employees share their information and ideas openly (Shellenbarger 2011). In return hiding mistakes is not tolerated. Examples of companies celebrating their failure are the Consumer Electronic Association (US) or Grey New York (US). In particular, Grey New York celebrates failures by presenting their employees with a quarterly failure award, for attempting something that was worthy of development but that subsequently failed. The thought is that if the employees are open about trying risky, unproven or new ideas and creating failure, but learn from it, then failure can be seen as a good thing (Sellenbarger 2011). In particularly Sitkin (1992), who introduced the term 'intelligent failure', argues that it is even a 'prerequisite' for organizational learning and development. Therefore, Cannon and Edmondson (2005) argue that it is useful to set up managerial coaching and skills development in order to build up such a learning environment, where failures can be identified and built upon. Furthermore, senior executives need skills in managing the conflicting perspectives that could emerge as

failures are analysed and explored. In this case, skilled facilitators can be used to ensure a learning orientated discussion is evident when analysing failures. Finally, to overcome barriers to experimentation, managers need to offer resources and align incentives to promote effective and creative experimentation. This also requires a constant reporting of small or large failures, followed by analysis and a proactive search for capabilities to experiment (Edmonson 2005). It is essential that managers understand the value of intelligent experimentation, publicizing both failure and success, then the employees see that the ideal of learning from mistakes is more than management speak, which is important for understanding and endorsing the "intelligent failure concept" (Cannon & Edmonson 2005, p. 316). Moreover, identifying skilled individuals, who can be trained in evaluating experimentations and reviewing pilot projects effectively and supportively, is an important organization capability. Related to this is setting a tolerance band or target failure rate for experiments as it will encourage employees in trying experimentation. 3M, the Bank of America (Cannon and Edmonson 2005), Grey New York (Shellenbarger 2011) and Procter & Gamble (McGrath 2011) are successful examples in encouraging sophisticated experimentation with a real failure-tolerant culture, where even failures are rewarded. The former CEO of Procter &Gamble, A.G. Lafley, took a bold step by openly celebrated his eleven most expensive product mistakes, focusing more importantly however on what the corporation learned from each one. According to Lafley and Charan (2008) that kind of failure-tolerant, culture building should occur at all levels of the company. Furthermore according to Edmondson (2011), managers who actively encourage intelligent failures, can equally avoid unintelligent ones, for instance by not making the same mistake again and again or failing by pure carelessness (Cannon and Edmondson 2005). In their experimentation they will have learned to recognize mistakes and to control for carelessness. In the end managers have to develop their own emotional and psychological ability to shift from traditional (risk adverse and

failure intolerant) to learning-oriented cultures that actively think and embrace their failures (Edmonson 2011).

Canner and Mass (2005) however present a different view by suggesting that innovation is motivated by desperation rather than by a creative atmosphere and this reflects the earlier sited study by Bessant, Phelps and Adams. In desperation, the risk of seeing an idea negatively is significantly reduced, which in turn motivates people to share their insights. In this case Valacich et al. (1994) make the suggestion that an anonymous submission system might increase the churn-rate for ideas, by reducing the risk of offering ideas that could be seen negatively. They also suggest that in desperation managers are more attentive and receptive to innovative solutions, so in this context anonomising the idea creators might create a higly receptive environment for both idea creation and adoption. Similarly, Shiv (2011) describes the method of instilling in people a sense of desperation, by reducing resources considerably so that they are forced to seek out new solutions – this reflects the age old adage of 'necessity being the mother of invention'. An example could be by cutting a team´s advertising budget while demanding increasing performance (Shiv 2011). Also Bessant, Rush and Trifilova (2012) argue that in particular, crisis conditions heighten the need to search for new solutions, in which conventional solutions are not suitable or practical. Especially in India, where resources are scarse, 'jugaad' is part of the management lexis (Shiv 2011). Presented by Radjou 'jugaad' is a Hindi word meaning "an improvised solution born from ingenuity and cleverness" (Radjou et al. 2012, p.4) which leads corporations to innovation and huge growth in a hypercompetitive world. Western firms such as Apple, 3M, Google or IBM, which are applying the principles of 'jugaad' to create innovate cheaper, faster, and better products and services (Radjou et al. 2012). The six principles of jugaad innovation consists of: (1) seek opportunity in adversity, (2) do more with less, (3) think and act flexibly, (4) keep it simple, (5) include the margin, and (6) follow your heart (Radjou et al. 2012, p. vii).

Harford (2011) reports, that most of new ideas don´t work the first time and the way to success is to anticipate failure and develop methods that correct errors. That's why he developed the concept of failure adaptability, which consists of three steps to yield something unique. First, encourage people in doing new things and expect high failure rates. Secondly, make failures survivable in doing new things in small experiments, where dangers from mistakes are controllable. Third, to ensure when it is obvious the experiment has failed and afterwards evaluate the results. On a similar topic, Sitkin (1992) argued that moderate failures lead the organizational attention to potential problems, which stimulates a problem-solving-approach and motivates the employees to improve. This strategy of small losses predict that an organization becomes better at risk taking, more agile, and more skilled at organizational learning when it adopts of the concept of intelligent failure successfully. To enable 'intelligent failure', Sitkin (1992) describes the following procedural method. First, to gain diagnostic information, followed by limiting costs of failure, then generating a fast feedback and finally focus on well-known domains. Cannon and Edmonson (2005) argue that organizations which are learning to fail intelligently have a deliberate strategy to promote an environment of improvement and innovation. In this case, they developed a model of three key processes through which firms can learn from failure intelligently – beginning with identifying failures, followed by analyzing failures and then sophisticated experimentations. The first process requires the construction of an information system to record and organize data in order to detect anomalies. Additionally, the establishment of a psychological safety environment where failures are seen as an instrument of learning, and managers are trained in coaching skills is required. For analyzing failures effectively, specific guidelines are useful. Further, experts within a group dialogue should be available likewise the ability to learn collaboratively. In the end, a sophisticated experimentation is the most productive process to generate solutions for problems, new

ideas, services and after all innovations. Another approach is promoted by Jack V. Matson – the concept of Intelligent Fast Failure (IFF). It is presented as a theory, a method and a useful teaching tool for creativity and innovation and for maximizing individual and institutional productivity (Tahirsylaj 2012). Matson (1991, 1992, 1996) argues that it is important to understand the breakthrough of creativity and innovation is based on knowledge acquisition and fast failures, e.g. due to experiments, which are essential elements of the learning process. As a precondition for IFF, Matson (1991) calls for two organizational conditions - firstly, to accept and understand the fear of failure and secondly, to decide on learning from failure as a way of life. Following this, when dealing with new ideas, the concept consists of the key steps of STRAFE, CHAOS and Fast history. STRAFE signifies 'Success through Rapid Accelerated Failure Engineering and Entrepreneuring', which means that only few ideas will be successful, whereas others will only generate learning. Furthermore CHAOS signifies 'Havoc Accelerates Outrageous Success', which means that the product or process needs to be improved, refined and redesigned in that way, that the adoption of a competition is largely excluded. Within the last step Fast History, Matson (1991) argues, that nowadays any successful product, idea or design is temporary. Thus it is essential to variegate ideas and concepts by looking at new directions. Closely connected to that is the thought of serendipity, which means that ideas often arise unexpected, where a high level of diversity in hobbies along with curiosity are needed to generate new ideas. Concluding that concept, Matson (1996) presents three principles, which are closely connected with IFF. Among generating ideas and shifting perspectives, Matson (1996) mentioned also running experiments just like Cannon and Edmondson (2005) or Harford (2011). The next concept by Rita Gunther McGrath (2011), a researcher in strategy and innovation in uncertain environments, contextualizes Matson's concept of IFF to work. The tracked target is to help organizations in learning from failures. McGrath`s seven principles are: (1)

decide what failure and success would look like before you start an initiative, (2) convert assumptions into knowledge, (3) be quick about it—fail fast, (4) contain the downside risk—fail cheaply, (4) limit the uncertainty, (6) build a culture that celebrates intelligent failure, (7) Codify and share what you learn (McGrath, 2011, pp.79-83).

Open Innovation & Failure

Another path company's follow in managing innovation as a result of the economic crisis, is the establishment of knowledge capital, which is shared through collaboration with other institutions and enterprises (Laperche, Lefebvre and Langlet 2011). The development of the open innovation paradigm is linked to several changes by a growing presence of venture corporations, a growing mobility of high skilled employees, new capabilities offered to the market and the increasing possibilities of external suppliers (Chesbrough 2003). The 'Global Innovation 1000' even suggests, that open innovation is one of the most essential possibilities for innovative companies, in good and in hard times (Jaruzelski and Dehoff 2010). Furthermore, the economic crisis leads companies to new strategic uses of intellectual property rights. Particularly, patents are considered as financial assets, which may strengthen the firms' value (Serfati 2008), especially in very innovative sectors such as information technology or biotechnology (Lallement 2010; Penin 2010). Another direction, triggered by the economic crisis leads companies to the development of new innovation paths, like greening the economy (Laperche et al. 2011). There the focus is on developing clean technology as a way to overcome the crisis (OECD 2009). Finally, also a low cost strategy is gaining ground, which affects both the design and the production of products and new technology in emerging countries (Laperche et al. 2011). That strategy, characterized by Vijay Govindarajan is denoted as reverse innovation (Govindarajan, Trimble and Nooyi 2012). They point out, that a large

number of companies like Procter&Gamble, Pepsi, Renault or Nestlé are practicing reverse innovation in India, Africa or China successfully.

These different principles and concepts, whilst not an exhaustive literature review, do suggest how harnessing failure and more importantly learning from failure can be adopted into the strategies and leadership styles of organisations of all sizes and in all sectors.

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A ‘very PC’ company that nearly lost its reason for being

Case study

Context

Very PC was launched in 2004 to provide information technology support for small and medium sized enterprises, is family owned and managed, and from the start the company strategy incorporated strong "environment and sustainable" ethical values.

Innovation

In 2006 the company developed a desk top computer that would operate with a fraction of the energy required for conventional desk top computers, using off-the-shelf components but placing them in an architecture and casing that was designed to deliver a more efficient use of energy. The company invested significant effort in building local sources of supply, where necessary the company sought responsible sources of raw materials such as Icelandic aluminium and halogen free cabling, as an example. The technology was rewarded with a buoyant order book from the public sector and a number of awards. Within the retail markets, using resellers under license, the company rode the "green IT" buzz and the demand for the "green" PCs looked secure. This was in-part due to the distributer having a reliable reseller network and the deal also promised marketing resources in return for higher margins. However, putting its sales effort entirely in the hands of the distributer was a radical step for the company.

The Failure

The company was approached by the BBC Dragon's Den programme to be a participant. The decision to take part was based on the premise that it would raise public awareness and potentially accelerate sales growth. However the experience was not rewarding, as they had hoped. The design

concept of using existing components to design and build a greener desk top computer was not well received and the lack of proprietary intellectual property was criticised. The results led to a loss of customer confidence in the company.

The company then experienced rising tension within the board of director (all of whom were family members) brought on by the 'public' nature of the failure. As a result the then Chief Executive chose to attempt to prove the critics wrong, but this was not a united decision within the company. With a rift in the business deepening the business chose to invest in a new set of technologies, including experimenting with oil cooling for the PCs. This attracted regional investment funding and eventually the company were able to spin-out the new technology into the US. With the rift in the company at its worst the Director responsible for the new technology left the company and followed the spin-out.

The innovation failure, in terms of the rejection of the initial products by the Dragon's, the media, and subsequently the customers occurred whilst bringing the company's products to market. When faced with adverse publicity, the then leader of the company chose to focus on product redevelopment whilst leaving the businesses operating model unchanged. What they have since learned is the distributer channel to market was not well understood in the PC industry and as a result business performance continued to suffer.

Transformation

Following the departure of the Chief Executive, the family company rallied and appointed a new family member into the role of Chief Executive. By undertaking a strategic review the company performance it was evident that the company was in a difficult market; the energy consumption of the normal PC was reducing anyway, which undermined the original value of the company's offering. Simultaneous-

ly developments in cloud computing was making in-house ownership of IT infrastructure less attractive for many potential customers.

Listening to their customers the new CEO examined the offering and the reseller activity and they soon discovered that whilst the resellers were using the green credentials to 'open doors', they were then selling other products with more favourable margins to the customers, forsaking 'Very PC's' products. The nature of the distribution and reseller model also placed the company very distant for their end-users and it was soon evident that these customers were less interested in the products; which were becoming commoditised, but rather they were interested in integration services; they did not want to have to piece together all the parts of a complete information system themselves. The distributer eventually took only about half the products that had been the forecast. The company was therefore left with an immediate problem with a significant amount of its cash tied up in working capital. The recovery really began following a restructure of the sales team and a revision of the marketing strategy, where key accounts became the focus, along with a return to direct sales and a reemphasis on developing close customer relations. That was in March 2012. Today the company focuses on providing specific services to key market segments, often supplying other makers' technology, when the client specifies it. In 2013 25% of the company's revenue comes from cloud computing services tailored to small and medium sized customer needs, 25% from a separate subsidiary set up as a reseller that focuses on hardware sales to local businesses.

The strategy itself, according to the company, was not published – rather it has evolved from a core foundation developed by the incoming CEO. The company has also developed a customer relationship management system, and whilst the ownership of the company remains the same as it did at the start, the structure is now very different. The com-

pany continues to espouse green values but the economic environment dictates that costs are kept low. The aim is to maximise the value of the accounts the company has and a result of these changes the company has started to make profit, is controlling its business better, has a vocational recruitment strategy to engage local workforce and ensures that everyone knows how they can contribute to the company's success.

Role of Leadership

The future – according to the company lies where "platforms will be a service". Pricing of licences for dedicated servers is high. Rather customers will increasingly only pay for what they use. They are developing a technology roadmap, looking at the possibility of the company providing these services using company owned servers, and grow their portfolio of products and service by continuing to go out to customers to see what they buy, which will include establishing a 'Delphi-style' group of customers to test new ideas and understand their competitors more.

The role of the leader in this turnaround story has been fundamentally important. It is the leader that determines the direction of travel for a company. The previous leader was very driven by the desire to provide greener hardware for desk tops. Initially the signs were good and the green credentials of the company's products were applauded. But when it came to commercialising the company's innovative product designs it was found that using a national forum for getting out the company' green message was a risky strategy that misfired. Whilst the leadership of the company continued to pursue product innovations the financial performance suffered. It was only when a new leader came in and took a fresh look at the company's market that an innovation in the company's business model was implemented leading to financial stabilisation. The future is not yet secure

and further innovation will no doubt be required to allow the company to grow and prosper but the current leader has shown his willingness to adapt to the needs of the company's customers whilst maintaining its strong green values. He is already demonstrating this with innovative marketing techniques using web forums such as www.edugeek.org, prize draws and other such techniques the company can obtain data on customers.

Employee innovation takes time to build but only seconds to destroy

Case study

Context

Magna CNC was a small precison engineering company located on the outskirts of Bristol in the Southwest of England. With more than 110 staff, spread over four adjacent industrial unit, the company had prospered in the late 1990s servicing the growing market for CNC-machined precision components for the UK aerospace market. In 2001 the family-owned business went through a significant director-level restructure with the Managing Director stepping back from day-to-day operations, leaving his sons, the Technical and Operations Directors to manage the company.

Innovation

In 2002 the company decided to purse a challenging course of continuous innovation, signing up for a two-year project to implement lean manufacturing across the four factory units. A Business Improvement Manager was appointed, to lead the operational transformation. A period of change ensued within the company – a programme of 5S was implemented, floor areas painted, workspaces re-allocated and structural refurbishments undertaken to ensure smooth operational flow of components between newly formed productions cells. A Kanban system of process control was implemented, following an extensive Value Stream Mapping and Bottleneck reduction exercise which lasted more than 6 months. To compliment this a programme of cultural change was implemented with social events, a staff notice board, regular team briefings and a new performance-related bonus scheme. As a result employee attendance improved from a poor 91% across the workforce to an impressive 96% over the following 6 month period, stock and WIP was reduced by around 10% and 12% respectively, and machine set-up and utilisation rates were increased accordingly. As a result of these changes, coupled with a director-led marketing drive, an important and potentially game-changing

contract was landed to supply assembly kits for the new Airbus A380 aeroplane. This signalled a coming of age for the company, moving from a dependance on manufacturing legacy components and the quick turnaround, but lucrative Aircraft-On-Ground spares manufacture to a more stable place in the regional aerospace supply-chain.

The Failure

With bouyant trading and a rapidly stabilising order book the future looked promising for the company and as a result the then MD chose to retire, leaving the running of the company entirely to his sons – one of which was appointed to the role of MD, the other retaining thier role as Operations Director. The Business Improvement Manager was made a permanent member of the senior staff and programme of further operational innovation was approved for the coming 3 year period – culminating in the goal of gaining Advanced Product Quality Planning (APQP) and the sought after American Aerospace Approved Supplier status.

Unfortuntely, not unlike many family businesses, the majority of change, in this case the new innovation activities and the focus toward continuous improvement, was being championed by one of the Directors – the Technical Director. Becomming MD only reinforced their desire to continue to improve and to capitalise further on the opportunities that were now coming more and more frequently until one particular event disupted both the operational performance and the culture that they had worked so hard to establish.

With a backlog of work in the Aircraft-On-Ground production cell an unlimited overtime opportunity opened up to a number of machining staff. Unfortunately not all the staff were as trustworthy as they might have been when working unsupervised and one Saturday and Sunday, on an off chance, the Operations Director discovered that time was

being claimed by staff who had not actually attended work. In a split second decision the Operations Director applied a contractual Gross Misconduct provisions and dismissed 5 staff working in the AOG production cell (although it later came to light that only 2 of the staff had falsified thier timesheets). As a further display of authority the Operations Director stopped all overtime payments to all company staff for that month, even though they had already undertaken the work.

The ramifications of this on-the-spot decision turned out to be quite siezmic – the staff who were dismissed were able to gain employment on better terms and conditions in a neighbouring CNC facility and they made this known to thier ex-colleagues. Whatismore, the strong culture that the organisation had fostered turned against them, with the now disgruntled workforce placing the recently dismissed staff on a metaphorical „martyrs" platform. Over the following 6 months more than 40% of the long-term production staff left the company for new employers and the production and continuous improvements began to erode as a result. Staff moral dropped, on-time delivey suffered and the presdigious kitting contract was put into „expediting".

Transformation

With the company performance significantly impared, the Ex-MD returned from retirement, but to the surprise of the workforce did not drop-back into his role as MD. Instead he took a bold step and placed himself onto the shop floor as production manager and began the daily expediting of the backlog of spares and kitting that had acrued. In a comprehensive movement the new MD, working in conjunction with his father on the shop floor, developed a campaign to reward and recognise good working practices, whilst promoting the company's capabilities further afield than the Bristol catchment, attracting staff from other parts of the

westcountry and offering them flexible shift patterns and long working hours over short working weeks, to entice them to travel and live away from home. Further the company, whilst never formally accepting that they had „made a mistake" learned an important lesson – which they widely acknowledged in thier recently re-launched staff newsletter. They also laid on a number of „contract completed" celebrations, where the workforce and thier immediate families were rewarded with generous hospitality. This slowly began to repair the staff moral.

Role of Leadership

There were two notable changes to the company's leadership over the period of success and then failure. There was a recognition within the senior management team that they had underestimated the loyalty and moral they had built during the period of continuous improvement and did not predict the strength of feeling that occured within the workforce over the dismissal of thier colleagues. In terms of the recovery, the leadership team also began to pull together as a result of the inherent crisis that was building in terms of delays in production and potential contractual breaches in terms of missed delivery. The decision to take a workforce position, by the returning ex-MD, created a shockwave across the remaining staff signifying that things were difficult and that things would need to change. This singular act signified a turning point – empowering the senior management team (who, having approached the ex-MD for help, assumed he would automatically drop into his old role and they too would revert to thier old roles accordingly) and also embodying to the workforce the commitment to the company of their management team. One further change occured when the company was again stable – the ex-MD returned to his retirement and the senior management changed the name of the company to what it is today (not Magna CNC – but the new name is withheld on request). It was noted that the

memory of the Bristol workforce catchment was a long one and this renaming was undertaken to try to erase some of the company's less favourable reputation.

Failure-driven innovation from a Network Perspective

by Olivier Berthod

Failure-driven innovation at the network level

Literature review

Studies of alliances and R&D cooperation among organizations and firms (e.g. Kleinknecht and Reijnen 1992) triggered a large research effort on the role of interorganizational ties and relations in the genesis of novelty, eventually proposing that networks has become the cradle for innovation and change in markets and the public sphere (Shan, Walker and Kogut 1994; Powell, Koput and Smith-Doer 1996; Porter and Ketels 2003; see Pittaway et al., 2004, for a systematic review of evidence behind this argument, among others). Interorganizational networks are most often defined as hybrid governance form, evolving somewhere between market and hierarchy, in which three or more organizations rejoin in collective activities striving for a set of aligned goals (Grabher and Powell, 2004; Pittaway et al., 2004; Powell et al., 1996; Provan et al., 2007). Numerous potential partners for collaboration have been put to the fore, ranging from suppliers to lead users, suppliers of suppliers, venture capitalists, consultants, science partners, trade associations, incubators, industry parks, distributors, and even competitors (e.g. Enkel et al., 2005; Gassmann and Reepmeyer, 2005; von Hippel, 1986). Similarly, extant research reports on numerous reasons and advantages. For example, scholars have demonstrated how interorganizational collaboration may ease one's access to new technologies (Hagedoorn 1990), lead to quicker product development (Wasti and Liker 1997), open new pathways for innovations among manufacturers of complementary products (Langlois and Robertson 1992) and help sharing risk and costs in the development and introduction of an innovation (Lichtenthaler, 2011). Pittaway et al. (2004) further complements the list by adding access to new markets, pooling of complementary skills, safeguarding property rights and absorption of external knowledge.

With Chesbrough's work (2003) and his concept of open innovation, issues of collaboration among external partners as a means to generate innovations have moved from mere academic debate to become a priority for most companies, which contributed greatly in popularizing this facet of in-

novation management (Chesbrough and Crowther 2006; Gassmann et al., 2010; Lichtenthaler 2011 – for notable critics however, see Laursen and Salter, 2006; van de Vrande et al., 2009; West et al., 2006). Looking at the network dimension in particular, related research efforts most often concentrate on single firms or administration within a network, looking in particular at the benefits of network membership with respect to innovation and internal processes (Maula et al., 2006; Vanhaverbeke, 2006; Vanhaverbeke and Cloodt, 2006; West, Vanhaverbeke and Chesbrough, 2006). For example, Chiaroni, Chiesa and Frattini (2006) reported on Italian companies and focused on the journey of single organizations from closed to open innovations. Similarly, Dittrich and Duysters (2007) detail the process of internal change at Nokia that emerged out of its network membership, and Enkel (2010) describes the attributes required to make interorganizational collaboration fruitful. A second dominant research theme concerns issues of network management, mostly by hub firms or network brokers In point of fact, innovation networks oftentimes prove high in centrality (i.e. power and influence issues and control over specific resources) and low in density, thus raising questions of leadership, knowledge management, innovation appropriability, and network stability (Dhanaraj and Parkhe 2006).

Amid this diversity of research themes (Pittaway et al., 2004, have counted no less than 12 dominant and less dominant research themes with respect to network and innovation) studies of networked reactions in situation of failure is scant. In fact networks are more often mentioned in terms of externalities effects in order to account for success and failure in the introduction of an innovation than as a leadership factor (Arthur 1989; Valente 1996; Schilling 2002). Getting closer to issues of management, and reversing the original questions on whether networks make sense for innovation, Martin and Scott (2000) propose collaboration as a tool to compensate for factors of failures such as risks, high costs, limited appropriability in infrastructure technology. Net-

work, in this respect, can be seen as a system of failure absorption ––a point made by Anderson and Drejet (2008) when they show that networked and distributed innovation processes are better in uncertain and risky contexts, thus allowing single organizations to remain better informed and the whole network to react more quickly to threats. Similarly, and closer to our attempt, a somewhat more exotic stream looks at how innovations could help networks to better address future crises and failures, like environmental catastrophes and accidents that are external to the network. Looking at learning processes at the network level, this line of research, mostly located in the field of public management, recognizes the necessity to develop networked reactions to critical incidents and tracks innovations and novelty in technology and/or organizational processes that emerged as new answers to better address future crises collectively (e.g. Comfort 1993; Moynihan 2009). Also in market contexts, similar effects at the network level have been reported. For example, Ferrary and Granovetter (2009) have shown how venture capitalists contribute to get the complex innovation network underlying the Silicon Valley to learn. These findings are similar to the ones by Visser and Atzema (2007), who stressed the role of private and semi-public brokers in mitigating the various strategies of actors involved in a cluster. In a similar vein, Longhi (1999) shows how shared, endogenous pools of resources and the division of existing organizations into member spin-offs maybe necessary for networks and clusters to react to critical conditions, absorb consequences and plan for long-term growth. This line of arguments, however, tends to keep silent on the process of leading the network from failure (or risky situation) to innovation (or change). In point of fact, mamaging the network in this very area is a sensitive matter: too little management effort may contribute to under-exploit the potential of the network; too much management effort may contribute to erode the informal nature of the ties, diminishing their potential for exploration and creativity (van Aken and Weggeman 2000). In face of this paradox, and considering the scar-

city in research on failure-driven innovation at the network level, it is safe to say that much remains to be studied on network reaction to failures and on network management and leadership as drivers of innovation.

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Inventing collaboration in urgency

Case study

Context

This case study reports on the large-scale outbreak of a back-then unknown strain of enterohemorrhagic Escherichia coli (EHEC) in Germany in the summer of 2011. It illustrates how previously unconnected actors introduced an inter-organizational structure in order to face the situation. Leading actors at the national level were the Federal Ministries of Health and of Food, Agriculture and Consumer Protection, and related federal public agencies. Similarly, the regional public agencies of the German states (Länder) were involved with operative tasks. In addition, local human and veterinary health authorities, hospitals, medical practitioners and national reference laboratories further dealt with human health issues. EHEC is a bacterium present in the intestines of warm-blooded animals that may cause severe food poisoning to the human body, provoking, in rare cases, HUS syndrome (anemia and kidney failure). Standard EHEC infections are frequent in Germany, with about 800 cases reported annually. Between May and July 2011, a novel strain of EHEC suddenly infected a total of 3,842 patients in the north of Germany (2,987 infected with EHEC and 855 with HUS), causing 53 fatalities. From May 8 on, the number of patients with both EHEC and HUS increased dramatically and reached its apex on May 21 and 22. The usual treatments failed to function. The number of patients kept on escalating and the hospitals quickly ran out of resources. Meanwhile, public authorities were working on ways to track and isolate the disease.

Failure

Prior to the outbreak the institutions involved were divided along two main thematic streams: health on the one hand, and food safety/consumer protection on the other. The two ministries collaborated from time to time, but remained distinct organizations with specific hierarchies, data formats

and streams of information diffusion from national to local level. Formal and informal ties had emerged during past outbreaks, but never to the extent of the EEC incident in 2011. Hence, the lack of ties between the organizations, their bureaucratic heritage and the large uncertainty concerning the epidemics contributed to the general feeling of confusion, and also stressed the necessity to invent new ways of working together.

European agencies. This new organizational device allowed centralization of communication, data, hypotheses and analytical efforts, and shed light on the need for adjustments in data formats, software and investigative methods. After the epidemic, the taskforce became institutionalized as standard procedure.

Transformation

Activities were divided among members of the taskforce, along a mind map. Two main tasks emerged: investigating clusters of food consumption on the one hand, and clusters of food distribution on the other. While IT staff started programming new software infrastructures, members of the federal health agency RKI suggested a field-method inspired by police investigations on poison-based crimes. Researchers took pictures of numerous dishes served by one restaurant where a high number of patients had gotten infected. They showed the pictures to the patients and compared their answers with a full list of the ingredients included in the dishes. Soy sprouts seemed to be the key. The taskforce inspected the data on food distribution clusters and put them in relation to the outbreak clusters using the new infrastructures. Reducing the analysis to the clusters with the cleanest datasets, they determined the source spanning all clusters: the sprouts had been delivered by an organic farm in Germany, which itself had imported the seeds from Egypt.

Role of Leadership

As the necessity to bundle different sources of expertise, knowledge and capabilities arose, the discussions attracted people with experience in task forces and crisis management groups in different fields, who then became instrumental in operationalizing this new organizational device. Eventually, the task force was recognized as an adequate way to decentralize and better distribute leadership in crisis situations and cross organizational boundaries without the relational depth that conventional project-based structures imply. The professionals involved in the taskforce further worked in favor of its institutionalization by applying it again, successfully, in the context of subsequent outbreaks.

Data

This case study relies on an in-depth qualitative investigation based on over 40 interviews with professionals involved in the outbreak.

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Wakes of innovation at the field level

Case study

Context

At 10:29 PM on Sunday 31 May 2009, flight AF 447, an Airbus A330-200 operated by Air France, took off in Rio de Janeiro with Paris as its destination. Around 2:00 AM, the pilots entered a cloud layer. The temperature increased, thus augmenting the risk of ice formation around the plane. At 2:10 AM the Pitot tubes, which measure speed, most likely obstructed by ice crystals, reported flawed information, which lead the aircraft to disconnect the autopilor. This missing speed information lasted 29 seconds until the probes on the left side recovered, and 54 seconds until total recovery. And yet: during the four minutes that followed, the pilots failed to gain control over the aircraft.

Failure

With the speed indicator missing, the airplane's information system computed a loss in altitude. The pilot in charge pulled on the airplane's control to make it gain altitude. The airplane stalled losing its "flight envelope". From this position, the only way out is to push on the controls and let the plane drop; a maneuver for which the pilots had trained – even though superficially. Instead, the pilots, encapsulated in their cockpit (in night conditions, pilots must rely entirely on the indicators of the cockpit), kept on pulling on the joystick of the aircraft, reaching a point at which the plane's system stopped computing. The crew kept on struggling with the situation until collision with the ocean; it was 2:14 in the morning. The BEA, the French agency investigating the case, concluded: "[it] supposes additional work on operational feedback that would enable improvements, where required, in crew training, the ergonomics of information supplied to them and the design of procedures".

Innovation

The crash of flight AF447 triggered a wake of innovations at the field level. These innovations, too numerous to list, went in two main directions: technical improvements of the machine-user interface (e.g. development of new tubes preventing ice formation, new cockpit designs for better feedback processes and interactions, better transmission of basic parameters to the ground for continuous monitoring), and improvements in training (e.g. new simulators including critical situations and their recovery, better procedures to make decision among pilots and copilots, new criteria for certification and evaluation). Many public agencies and firms involved in the industry participated in the discussions surrounding the aftermath of the crash thus contributing to diffuse the innovative wake across the field of aviation.

Transformation

The initial investigations were headed by the French authorities for civil aviation (BEA). This included locating and recovering the remains of the aircraft, recovering the flight data and investigating the data. Two goals in mind: to understand what happened and to propose recommendations for the field of civil aviation. What started as a one-organization endeavor quickly became the center of tremendous attention. Airbus jumped into the discussion, as did AirFrance, and numerous other organizational stakeholders (e.g. pilots unions, victims' relatives associations and other public agencies around the world). At first, work remained mostly in the BEA's hands. Quickly, with the first results of the investigations, the wake propagated and numerous efforts for change began taking place among numerous other firms and organizations. The challenge remained: how to lead the wake?

Role of Leadership

The investigative reports took on the role of a trigger by diffusing recommendations and addressing first critics. But with respect to leading the wake of innovation and learning out of the dramatic event, working groups were instrumental. A first example: the human factor working group. The objective was to investigate cockpit ergonomics and improve the pilot-machine interactions. This group featured 3 experts from the BEA, 2 pilots, 1 psychologist, and from time to time experts from AirFrance and Airbus. A bigger example is the flight data recovery working group, which included over 120 members. Their goal: improve our capacity to locate and recover flight data. Many private companies from diverse fields (aviation, satellite technologies) took part in the discussions, together with regulatory agencies and other international organizations. Last but not least: the Aeroplane Upset Recovery Training Aid Working Group was instrumental in developing new guidelines for training, discussed by members of most major airlines, safety agencies, Airbus, Boeing and Bombardier, pilot associations, and other actors. Working at the field level, it became necessary to replace the field with a smaller representation in the form of working groups. Nonetheless: the larger the group grew; the more controversies arose…

Data

This case study relies on an in-depth qualitative investigation based on the investigation reports and semi-structured interviews with professionals involved in the industry.

Failure-driven innovation from the Process Perspective

by Sebastian Kunert

Failure-driven innovation at the process level

Literature review

How does a person best pursue an idea and implement innovations within an organization? Until today, in the field of innovation process studies researchers have tried to answer this simple question and search for the most successful, standardized sequence of manageable events (van de Ven & Pool, 1995)… and have largely failed!

Research on innovation process design

In the innovation literature, stage models (e.g. Morris, 2011; Scholl, 2006) are still dominant, often visualized as a funnel (e.g. Tidd & Bessant, 2009) or as a (value) chain (e.g. Hansen & Birkinshaw, 2007; Kline & Rosenberg, 1986; for an overview see du Preez & Louw, 2008; Wolfe, 1994). Those approaches suffer from a misunderstanding: phases of idea generation, selection, testing, accomplishing and disseminating do not occur once but are iterative during an innovation process (Anderson, De Dreu & Nijstad, 2004; Gamal, 2011; van de Ven, Polley, Garud & Venkataraman, 2007, Wolfe, 1994). When a simple innovation is borrowed or adapted from an external source, stages tend to occur in the expected order; on the other hand, when innovations are complex and/or originate within an organization, stages tend to be muddled and overlapping (Nutley, Walter & Davies, 2002).

Furthermore, stage models are primarily designed from an academic point of view but offer little advice for managers on how to organize, supply and control single innovation processes. This is because such models focus on the entire organization on a macro-level, usually based on surveys and secondary data instead of observation (Crossan & Apaydin, 2010, p. 1178). Van de Ven and colleagues conducted one of the rare longitudinal studies in 18 companies between 1982 and 2000 to investigate success factors for innovation processes and to identify an ideal procedure in idea man-

agement. Their conclusion still summarizes the current state of scientific knowledge: "No overarching process theory of innovation has yet emerged from the research program, nor are prospects bright in the near future." (van de Ven, Angle & Poole, 2000, S. 4; see also Hobday, 2005; Mahdi, 2002). To understand the pitfalls and conditions that lead to failure during the realization of an idea, stage models simply do not work. However, characteristics of innovation projects as well as their surrounding conditions turned out to be much more fruitful (Wolfe, 1994).

Research on innovation process failure

In the search for success / failure factors in innovation processes, the literature in project management provides valuable insights. Several papers offer lists of critical variables (for an overview see Belassi & Tukel, 1996; Brown, Schmied & Tarondeau, 2002). Overall, some recurrent factors emerge: clear goals, resources, communication and scheduling. However, most important seems to be top management support (Young & Poon, in press). Besides that, the importance of those factors differ depending on stakeholder (Davis, in print), definition of success, industry, organizational structure, and size of the project (Belassi & Tukel, 1996).

However, in some points innovation projects are distinguishable from ordinary business projects, which primarily means that they go beyond the ISO 21500:2012 definition of a "project". They start by nature with ill defined, sometimes even ambiguous objectives, need more experimental and exploratory methods instead of standardized procedures, are more likely to fail as they explore new territory, and finally need to be sold to certain sponsors or funding committees, a responsibility usually not required from normal project teams (Kastensson, 2011).

One of the most important (and complex) factors seems to be time (Cebon & Newton, 1999; Chiesa & Masella 1994; Hauser & Zettelmeyer 1997). First, a certain amount of time pressure is necessary for internal motivation (Andrews & Farris, 1972; Amabile, Mueller, Simpson, Hadley, Kramer & Fleming, 2002). On the other hand, time pressure inhibits creativity (Amabile et al., 2002) and causes mistakes and generates even more time pressure. A vicious circle that leads to failure when teams massively exceed deadlines. As Kunert (2013a) points out, duration of unplanned delays as a proportion of total project time is the most crucial factor for innovation project success. Cooke-Davies (2002) concluded his research by stating that average performance against budget is generally better than average performance against schedule.

However, organizations gain most valuable insights not from academic research but from evaluation of their own innovation projects. Different approaches are published from semi-structured interview guidelines (e.g. innovation project analyses by Kunert, 2013b) to holistic evaluation concepts (e.g. Technical Innovation Audit by Chiesa, Coughlan & Voss, 1996).

Research on innovation process management

The question "How does a person best pursue an idea and implement innovations within an organization?" is simply not answerable, because there is no best way. Besides that, many recommendations and management guidelines can be found to prevent innovation projects from failure. Below, some promising approaches are listed:

1. *Champions / Promoters*: Based on Schumpeter (1912), similar but independent theories of important individuals emerged (Chakrabati, 1974; Rothwell, Freemann,

Horsley, Jervis, Robertson & Townsend, 1974; Witte, 1973). While Witte (1973) assumed that motivated employees spontaneously take the promoter role, Rudinger (2012) reports a successful evaluation of a training program for innovation promoters.

2. *Leadership*: Elkins & Keller (2003) provide a comprehensive overview of studies concerning the role of leadership in innovation settings. More specific, Denison, Hooijberg & Quinn (1995; Hooijberg, 1996) introduce the "circumplex" model of innovation process for leadership, based on eight somewhat contradictory roles. According to the authors, managers must show some behavior complexity, which basically means to adjust their leadership style to the leadership requirements flexibly. Furthermore, that conception is connected to the model of corporate culture by Denison & Mishra (1995; Denison, Haaland & Goelzer, 2003). Howell & Higgins (1990a, 1990b) create a link between leadership and championing (see above) by describing the behavior of managers who act as innovation promoters. Even more concrete, De Jong & Den Hartog (2007) describe thirteen explicit behaviors to support members of innovation projects.
3. *Context*: Adams, Bessant & Phelps (2006) give an overview, in which frequently cited context factors can be evaluated using measures of inputs (including people, physical and financial resources, tools), knowledge management (including idea generation, knowledge repository, information flows), innovation strategy (including strategic orientation, strategic leadership), organization and culture, portfolio management (including risk/return balance optimization tool use), project management (including project efficiency tools, communications, collaboration), and commercialization (including market research, market testing, marketing and sales).
4. *Use of standardized project management tools*: As Milosevic & Patanakul (2005) point out, standardized

project management concerning defined processes and proven tools increase development projects success, even though different standard models vary in their usefulness (Jenkins, Forbes, Durrani, & Banerjee, 1997).

5. *Individual aptitude*: Crossan & Apaydin (2010) give a comprehensive overview about determinants on the individual level regarding competencies, skills, abilities and personality.

It is important to keep in mind, that all these approaches are not free of contradictions, inconsistent effects and examples of faulty implementation. Just like my colleagues, I believe that at the end of the day it is safe to say that much remains to be studied regarding the causes of failure and the role of leadership in innovation processes.

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Waste(d) idea management

Case study

Context

The company in this case study is a 100% subsidiary of a global waste management corporation based in Germany. The approximately 65 employees sell and distribute used paper, glass, plastic, metal, and composites. That is to say, they organize the buying, the transport, the sorting, and, finally, the selling to producers. The company is highly profitable, with lean processes and a highly skilled, motivated staff.

However, the management worries that its business might get outsourced due to the highly standardized nature of its services: organizing purchases, transport, sorting, and selling of waste. These activities are hardly unique. As a result, dissociation takes place mainly by costs and gains. To make things worse, the parent corporation started a merger process and new departments for sales & distribution now appear inside the holding. Consequently, being innovative, being the first in new markets, and being the first with new (integrated, sustainable) customer services is the key to long term survival.

The company's business performance is good. However they lack the ability to change. An innovation survey (questionnaire throughout the company, interviews with 12 selected employees) revealed that

- the high amount of work led to little motivation to innovate
- innovations were hardly encouraged by management or honored by colleagues
- a culture of lone wolves hindered cooperation
- the reward system emphasized short term goals in the main business

In summary, this company was not a market leader but instead chased after lost opportunities.

Innovation

Two members of middle management came up with the suggestion for an idea management tool. It included a formalized process to gather, select, evaluate, and reward new ideas. Furthermore, they defined a jury, a list of gratifications and a call for proposals based on the company's strategy. The development & implementation was participative (survey feedback, enlarged project group, updates on team meetings and annual Employee Day). For dissemination they announced a competition to find a mascot and more than twenty suggestions were posted.

Failure

Top leadership canceled the project shortly before roll out ("If they've got the time to do that, there are free capacities to do usual business!"; "Being innovative is part of the job and shouldn't be rewarded on top of it!"). The participation activities mainly addressed staff members, not senior management. As a result, the invention was created by middle management (team leader level) and supported by lower level employees but it suffered from upper level authorization requirements.

Transformation

The implementation of an idea management process was not only a simple tool realization. It was a big innovation with consequences for the company's processes (how do ideas come to life), structures (to judge ideas gives power) and culture (staff co-decides strategy). Moreover, this tool revealed a main reason why innovation was so rare. Top Management was afraid of resource demanding changes, of time waste in a fast and highly competitive business, and of giving away power in a masculine culture.

The transformation succeeded when the two inventors started a completely new approach towards participation (this time addressed towards top management). They searched for a power promoter, presented their project in management meetings, made cost calculations, and highlighted the gains for the greater corporation. Most importantly, they gave control back to management by starting a pilot instead of an entire roll out, by limiting the reward list, and by authorizing the topics to be announced.

Role of Leadership

Middle management experienced common symptoms of a sandwich position between staff and top leaders. Typically, many inventions fail because of poor, insufficient or misaddressed communication. In this case, an upward and a downward communication strategy was needed because each group focused on different aspects.

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Mired in projects

Case study

Context

The company in this case study offers services in hardware, software and technical networks for law firms. They implement standardized products as well as customized solutions. The seven employees (2 sales, 5 technical support) and two managing partners, all based in Berlin (Germany) run a stable company with mostly long term business relations. However, the IT market is highly competitive and demands constant innovation. Therefore, in that organization every member takes part in innovation workshops, is involved in several projects simultaneously and invests about 20% of working time in the implementation of ideas.

Innovation

Most innovations were about new IT services, for example in-house server-based automated data mirrors and automated remote control devices. Few projects focused on internal processes, for example an automated booking and reporting system. Most of the innovations were initiated by one partner, who also monitors, accepts or revises the outcomes. All projects were driven by a single employee and had to be done parallel to the core business. In a handbook all process steps and formalities are deeply fixed (by the way contrary to scientific findings, see van de Veen, Angle & Poole, 2000).

Failure

An innovation survey (questionnaire and interviews throughout the company) revealed that:

- far too many projects were initiated by management at the same time (over 20) with very long time periods (on average 18 months instead of desired 9).

- projects were much more complex for employees (in average 17 steps) than expected by management (7 steps).
- management monitored poorly, especially the outcomes. The partners changed success and outcome expectations during the project or, even worse, at the end. That led to long durations and much frustration.
- management offered too little assistance and encouragement, e.g. the bonuses were only paid for customer services and sales, not for innovation projects, hence all colleagues tried to minimize their effort in others projects.
- projects were communicated as cost factors by management in their annual financial reporting; earnings in the long run were not connected to former initiatives.

In sum, this company had much more ideas than resources to implement them. Project leaders felt mostly left alone. The overall outcome was quite small compared to the investments: increasing unfinished or escalated or failed projects, and decreasing volume of sales with new products and services.

Transformation

Transformation started with moderated survey feedback workshops, followed by a task force with quarterly meetings over two years. The partners committed themselves to start less projects, to fix the desired outcomes in a specification sheet, to report gains from former projects and to share financial gains with the project leader. Furthermore, innovation management was installed which acts as a process promoter (c.f. Chakrabarti & Hauschildt, 1989).

The innovation manager mediates between management and staff, hosts supervision meetings, initiates project mentoring, intervenes in crises, connects to resource holders

and gives practical advice. By so doing, management tried to erase the stigma of blood, sweat and tears from innovation projects and to bring back fun and glory for successfully implemented ideas.

Role of Leadership

Leadership in this case was ambivalent. On the one hand, they contributed most of the ideas, authorized resources, matched projects with the company's strategy, and emphasized the relevance of innovations. On the other hand, they built formal barriers to the implementation of ideas and left the project leaders alone most of the time. Most important for leadership was a slight role change: less innovator, idea generator, and process chart producer, more controller, adviser, and strategist. Besides that, the new innovation manager acted as a backing for the management by giving them information and feedback as well as supervising the project leaders.

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Failure-driven innovation from a Learning Perspective

by Torsten Oliver Salge

Failure-driven innovation and organizational learning

Literature review

Accidents, errors and other unintended, potentially harmful deviations from planned courses of action constitute vital occasions for organizational learning (Baum & Dahlin 2007; Cannon & Edmondson 2001; Haunschild & Sullivan 2002; Madsen 2009; March et al. 1991; Perrow 1984; Ramanujam & Goodman 2003; Reason 1997; Roberts & Bea 2001; Weick & Sutcliffe 2007; Zhao 2010). Indeed, theory suggests that failure might be an even more effective and durable teacher than success (Cyert & March 1963; Sitkin 1992). In particular, failure experiences are assumed to induce non-local search resulting in explorative learning while success experiences are expected to trigger local search and exploitative learning (Baum & Dahlin 2007). Interestingly, extant empirical findings remain ambiguous in that failure experiences were found to be more effective than success experiences at the organizational level (Madsen & Desai 2010), yet less effective at the individual level (Argote & Miron-Spektor 2011; KC et al. 2012).

Prior empirical research on learning from failure has focused on learning outcomes rather than learning processes, resulting in recurring calls for research that addresses this gap (Baum & Dahlin 2007; Madsen & Desai 2010; Ramanujam 2003). Considering different influencing factors on the efficacy of failure-induced learning, researchers confirmed the antecedent influence of prior extreme performance experiences (Kim et al. 2009), the role of context specifity and similarity (Muehlfeld et al. 2012), the mediating role of leadership (Carmeli & Sheaffer 2008; Vera & Crossan 2004) and the moderating effect of after-event reviews (Ellis et al. 2006). Additionally, organizations do not only learn from their own past failure experience (Baum and Dahlin 2007), but also from critical failures (Madsen 2009) or near-failure experience (Kim and Miner 2007) by others. However, such vicarious learning involves the risk of a selection bias, potentially resulting in irrational biased decision making processes (Denrell 2003).

The severity of failure plays a major role in the discourse. Clearly, organizational decision-makers initiate change and learning activities as a result of major disasters and crises that occur only rarely, yet cause extraordinary human suffering and financial damage (Baum & Dahlin 2007; Haunschild & Sullivan 2002; Madsen 2009; Madsen & Desai 2010; Weick & Sutcliffe 2003). Failures of relatively small magnitude and high frequency, however, often fail to trigger systematic learning despite their notable potential for boosting organizational reliability (Provera et al. 2010; Rerup 2009; Tucker & Edmondson 2003; Weick & Sutcliffe 2007). Perhaps most importantly, small failures have to be identified as particularly salient amidst a vast pool of internal and external stimuli competing for managers' attention in order to trigger systematic learning (Lampel et al. 2009; Rerup 2009; Weick & Sutcliffe 2006). As managerial attention is limited and selective (Ocasio 1997; Simon 1947) decision-makers are able to attend only to a limited number of (non-routine) issues at any one time and risk overlooking small and inherently less visible failures. Such ignorance, however, can be particularly fatal in the built-up to major accidents, where minor incidents constitute essential weak cues that signal potential threats and point to possible corrective actions (Dillon & Tinsley 2008; Marcus & Nichols 1999; Ramanujam 2003; Zohar 2000). This 'attention problem' can be addressed by means of systematic error reporting routines. As Zhao and Olivera (2006, p.1012) highlight, "error reporting is often the only means by which organi-zations become aware of errors and of the circumstances leading to them." Additionally, employees frequently hesitate to bring small failures to the attention of their managers, as they are not willing to take the substantial interpersonal risks that can be associated with error reporting due to attributional biases in the aftermath of minor and major failures (Cannon & Edmondson 2001, 2005; Carmeli 2007; Carmeli & Gittell 2009; Edmondson 1996; 1999). This 'attribution problem' results first and foremost from decision-makers' general tendency to assign responsibility - and blame - for

errors, near misses and other incidents to specific individuals rather than existing organizational processes or systems (Fiske & Taylor 1991; Morris & Moore 2000; Perrow 1984). A possible remedy to this second problem is the development of a reporting culture that advocates a fair 'no blame' approach to failure and should as such boost error reporting rates (Provera et al. 2010; Weick & Sutcliffe 2007; van Dyck et al. 2005). Hence, specific mechanisms need to be in place to bring small failures to the attention of decision-makers, if organizations are to harness the learning potential of everyday errors, near misses and incidents (Dillon & Tinsley 2008; Dutton & Ashford 1993; Dutton, Ashford, et al. 2001; Madsen & Desai 2010; Rerup 2009; Tucker & Edmondson 2003). It is only then that effective second-order problem solving can be instigated, as part of which actions to address the underlying causes of observed failures can be developed (Tucker & Edmondson 2003). Despite recent calls, rigorous theoretical and empirical research on this important matter remains strikingly scarce (Baum & Dahlin 2007; Madsen & Desai 2010; Ramanujam 2003).

Despite the sizable body of extant research adopting an organizational learning perspective on failure as a trigger for change and innovation, a number of puzzles remain to be addressed. In particular, the individual and organizational ability to learn from own failure might be hampered by managers' general predisposition to attribute failure to exogenous causes (Baumard and Starbuck 2005), to engage in defensive behavior and to develop inherently distorted accounts about the underlying cause-effect relationships (Starbuck, Barnett and Baumard 2008). Moreover, further research on the temporal dynamics, the amplifying factors and the subtle micro-processes of learning from failure is urgently needed if we are to more fully understand this complex, yet highly relevant phenomenon.

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Failing to learn from failure

Case study

Context

Mid Staffordshire NHS Foundation Trust is part of the English National Health Service (NHS). The NHS is a public health care system delivering primary and secondary care to English citizens that is free at the point of care. The trust itself consists of two hospitals located at Stafford and Cannock. Stafford Hospital is an acute care hospital founded in 1983 with approximately 345 beds. Cannock Hospital was founded in 1991, manages 115 beds and specializes in orthopedic and rehabilitation services. A total of around 3,000 employees are responsible for a population of 320,000 citizens in the greater Stafford area. In February 2008, the Trust's application for Foundation Trust status was granted, as a result of which it obtained greater organizational and financial autonomy as reflected in the right to retain profits and access capital markets.

Failure

Severe quality problems were detected at Stafford Hospital in 2007. More specifically, the Healthcare Commission was alerted to the fact that hospital standardized mortality ratios (HSMR) for the financial years from 2005/06 to 2007/08 ranged from 127 to 145. This indicates that the number of actual deaths in the hospital might have exceeded the number of statistically expected deaths given the patient mix treated, by as much as between 27% and 45%, yielding up to 1,200 "unexpected" deaths. Especially mortality rates for heart, blood vessel, nervous system, lung and infectious diseases were significantly higher than statistically expected. Next to high HSMRs, front-line employees and patients alike reported poor standards of nursing and emergency care. Consistent with this observation, Mid Staffordshire Trust found itself amidst the bottom quartile of hospitals in terms of quality of care in 2007.

Triggered by these warning signs, three formal inquiries were conducted between 2009 and 2012. They provided evidence of dramatic shortcomings in management as reflected in dreadful clinical hygiene levels, alarming violations of patient dignity and respect, inexcusable delays in clinical assessment, provision of medication and pain relief, poor recording of important bodily functions, ignored symptoms and requests for help as well as insufficient communication between staff and patients or their relatives. Moreover, the inquiries found substantial problems with the trust's information governance and data exchange with national systems.

Repeated management failures and an excessive focus on boosting financial performance and meeting national standards figure particularly prominently among the likely root causes identified. In an attempt to achieve foundation trust status, Mid Staffordshire Hospitals' management team sought to realize cost savings of £10 million along with a £1 million surplus. This involved cutting 150 clinical posts as well as training expenditures, which resulted in understaffing in critical areas of care and subsequent problems in clinical leadership. Insufficient staffing levels triggered as series of clinical failings as illustrated by the fact that receptionists without medical training had to assess patients, that doctors had insufficient time for post-surgery supervision or that junior doctors had to run the hospital during after hours. Obsessed with meeting national targets such as reducing the maximum waiting time in the accident and emergency (A&E) department to four hours, managers had staff discard clinical protocols and move patients out of A&E without adequate assessment by qualified doctors.

Although initially benefiting from substantial bottom-up error reporting, management developed a visible reluctance to attend to – let alone react to – such vital signals. Unsurprisingly, employee voice behaviours were gradually replaced by persistent organizational silence. This issue was

further amplified by inadequate error reporting and analysis systems, precluding management to notice and understand recurring problems in patient care. Finally, a suboptimal clinical layout, missing equipment and a general lack of space and cleanliness further corrupted the conditions at Stafford hospital. The scope of management failure and the dreadful human suffering it spurred led the British Prime Minister David Cameron to apologize in February 2013 in public for one of the worst hospital scandals in history today known as the "Mid Staffordshire Hospital Scandal".

Innovation and Transformation

The three commissions in charge of the inquiries developed far-reaching recommendations pertaining both to the organizational level (i.e. Mid Staffordshire Hospitals) and the broader level of the organizational field (i.e. NHS Hospital Trusts). The recent "Francis Report" published in February 2013 alone contained 290 such recommendations, many of which call for management and process innovations both locally and nationally. At the organizational level, expert groups proposed sweeping changes including the need to develop novel incident and complaint reporting systems, to establish a clinical audit system fed by rich internal and external data on clinical processes and outcomes, to build a culture of openness and to shift the focus of organizational attention from national and financial targets to patient well-being.

At the level of the organizational field, investigators called for a mandatory national incident reporting system, improved patient complaint management, stricter legal sanctions for clinical negligence, higher patient orientation and novel clinical alert systems highlighting unexpected performance shortfalls. Perhaps most importantly, the inquiry commissions recommended the rigorous collection and timely publication of reliable information on hospital mortality rates

and other outcome indicators to inform patient choice and counteract the prevailing focus on financial instead of clinical performance. As Robert Francis concluded in his final report published in 2013:

"People must always come before numbers. Individual patients and their treatment are what really matter. Statistics, benchmarks and action plans are tools not ends in themselves. They should not come before patients and their experiences. This is what must be remembered by all those who design and implement policy for the NHS."

Leadership

Surprisingly, however, the trust failed to act adequately on almost all recommendations proposed by the three inquiry commissions. Managerial attention remained focused on financial and process rather than clinical outcome metrics, clinical audit and incident reporting systems continued to be inadequate and speaking-up remained discouraged and even sanctioned thereby cementing the prevailing "culture of fear" and fostering employee silence. Perhaps most astonishingly, senior management sought to attribute the alleged quality problems of its Trust to administrative coding errors and other measurement issues rather than to appalling clinical and managerial standards. Being reluctant to collect and share insightful outcome data, senior management precluded regulators and the general public from assessing the true scale of the scandal and the efficacy of possible counter-measures. Failing to learn from failure, the trust and its management saw its legitimacy gradually being withdrawn. This led to series of regulatory actions affecting not only the trust's autonomy, but also its license to operate. This involved the temporary closure of A&E, the replacement of senior management and the decision to put the trust under administration. At the organizational field level, in contrast, far-reaching changes could be implemented including the

broad dissemination of comparative mortality data via the NHS Choice website or the development of mandatory national incident reporting systems.

Data

This case study relies on data collected as part of the three formal inquiries published between 2009 and 2013. The first report published in 2009 was based on 309 interviews conducted by the investigation team in particular with staff members and patients of the trust. The second report published in 2010 drew upon oral evidence from 113 witnesses in person, while 164 witnesses were heard in person in preparation for the third report published in 2013.

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Responding to local failure

Case study

Context

The Bristol Royal Infirmary (BRI) and the Bristol Royal Hospital for Sick Children (BRHSC) are two teaching hospitals associated with Bristol University's Medical School. Today, both are part of the University Hospitals Bristol NHS Foundation Trust (UHB). In the early 1980s, the Department of Health and Social Security (DHSS) initiated funding for Supra Regional Services (SRS) to concentrate resources and expertise in specialized medical fields throughout the UK. The goal was to enhance clinical performance when treating rare conditions through more cases and practice at designated locations. One of the services funded by the SRS initiative was Paediatric Cardiac Surgery (PCS), which was limited to babies under the age of one year. Bristol Hospitals were made one of nine designated centres for PCS across England in 1984, with BRI performing open-heart surgery and BRHSC performing closed-heart surgery on infants.

Failure

PCS services at UHB were formally stopped in 1995, when unexpectedly high death rates following cardiac surgery of babies under the age of one were detected. Although, initial concerns were expressed as early as 1990, they escaped the attention of Dr Ryolance, the chief executive at Bristol at the time. In 2001, a formal inquiry commission led by Ian Kennedy presented its final report "Learning from Bristol" revealing death rates as much as two times higher than expected in five out of seven years during the period from 1988 to 1994. The excessive death rates were attributed to several problems at the field level (i.e. the whole NHS) as well as the organisational level including process failures and cultural entrapment within the trust.

At the field level, the NHS experienced a far-reaching reorganisation during much of the 1980s and 1990s. This trig-

gered resource and attention problems affecting the whole medical sector in the UK. Among others, UHB experienced a shortage in paediatrically trained nurses and cardiologists necessary for conducting operations, causing understaffed units and mounting quality concerns. These problems, however, escaped managerial attention as adequate standards and routines to monitor the quality of care within hospitals were still lacking within the NHS. At the time, no effective mechanisms were available to detect service failures, as reflected in unexpectedly high death rates following open-heart surgery on infants.

At the organisational level, a number of additional shortcomings contributed to high infant death rates. First, building infrastructure and key care processes were inadequate considering the needs of very young patients. While the operating theatres and intensive care unit (ICU) were located inside the BRI hospital site, the wards for post-surgery care were situated at the BRHSC site. This meant that children leaving the ICU had to be taken to the BRHSC for residential care, although both facilities were located several hundred yards apart from each other. Further, no effective child-centred approach was applied at BRI, as neither an adequate paediatric ICU nor designated paediatric cardiac surgeons were available. Children were thus treated by staff specialised in adult care using facilities tailored to the needs of adult rather than infant patients. Second, the culture within Bristol hospitals was described as uncommunicative instead of open. It resembled a "club culture" or a culture of justification. Staff was not encouraged to share their problems and concerns were not to be taken to the chief executive. Weick and Sutcliffe (2003) in their post-report analysis highlight a pronounced tendency among staff and management for external rather than internal attribution. More specifically, they explain that BRI and BRHSC staff justified the poor performance with anomalies and particularly challenging cases instead of seeking to unearth internal shortcomings. The club culture entailed a marked concentration of power within a closed circle. As stated in the report, "[ex-

ecutives] were either part of the 'club' or treated as outsiders" unable to influence senior management. It was arguably this combination of poor communication, inadequate teamwork, weak processes (i.e. unacceptably long cardiac care waiting times) and an unsatisfying hospital layout (with two sites) that led to dramatically increased death rates following heart surgery of children under the age of one – a case of severe service failure today widely known as the "Bristol heart scandal".

Innovation and Transformation

The commission in charge of the inquiry under the lead of Ian Kennedy developed far-reaching recommendations pertaining in particular to the organizational field (i.e. all NHS Hospital Trusts). The "Kennedy Report" published in 2001 contained recommendations pertaining primarily to standards of care, patient involvement and organisational culture within the acute care sector.

As for standards of care, the report called for an independent system to monitor care quality across the entire NHS. This would require not only appropriate process and outcome metrics comparable across service providers but also unprecedented data collection and analysis efforts. Similarly, a regulatory authority would need to be in place to oversee NHS trusts and intervene in case of sustained failure to meet national standards. Moreover, the systematic reporting of adverse events as a means to learn from clinical errors, near misses and incidents and prevent their future occurrence moved into the foreground. With regards to patient involvement, the commission advocated a renewed emphasis on the patient and her idiosyncratic needs. This holds first and foremost for children, which need to be treated in dedicated facilities and by adequately trained clinical staff, if they are to obtain the best possible care. The call for a stronger patient orientation, however, was more general in that it pertained to all patients irrespective of their age. More specifically, an

agenda for greater patient information, consent, choice and feedback as essential constitutive elements of every treatment experience was outlined, eventually triggering the birth of the world's largest patient survey programme to solicit systematic feedback from patients about their entire treatment experience from admission to discharge.

As for organisational culture, the report called for a culture of "[…] safety and of quality; a culture of openness and of accountability; a culture of public service; a culture in which collaborative teamwork is prized; and a culture of flexibility in which innovation can flourish in response to patients' needs" (Kennedy Report p. 13) needs to be created. This requires not only good communication between staff, patients and executives, but also an environment that is open, encouraging and non-punitive as well as a wider adoption of multidisciplinary teamwork.

Jointly, these recommendations have fundamentally transformed the NHS and the way it is governed. The outcome metrics (e.g. Patient Satisfaction Score), oversight bodies (e.g. Healthcare Commission) and patient involvement mechanisms (e.g. NHS Choices) that were created in the wake of the Bristol heart scandal have since then been – and continue to be – emulated across the world, fuelled by a growing recognition of the need to reward service providers for the care quality in addition to care quantity.

Leadership

Leadership played a pivotal role in explaining both the emergence of clinical failure at the local level and the far-reaching responses taken at the national level. As for the local level, Dr Roylance, a medical doctor serving as UHB's CEO at the time, introduced 13 separate directorates inside UBHT each led by medical professionals with little – if any – prior management experience. The unintended conse-

quence was a system of isolated units or "silos", which were characterised by a concentration of power at the top (club culture) and a lack of intra- as well as inter-directorate collaboration. This had notable negative side effects in the operating room, where staff members were hesitant to engage in multidisciplinary teamwork and to share problems with their respective superiors – activities that were particularly vital in the field of paediatric cardiac surgery. As for the national level, the Bristol heart scandal acted as a catalyst for profound structural changes. Strong political and academic leadership was essential at numerous stages of the transformation process. Sir Ian Kennedy, who chaired not only the public inquiry into the Bristol heart scandal but also the newly established regulatory authority until 2009 known as the Healthcare Commission, in particular was relentless in his efforts to identify root causes, to propose often evidence-based corrective actions and take the lead in implementing them at the system level.

Data

This case study relies on data collected as part of the formal inquiry published in 2001 and mandated by the Secretary of State for Health in the UK. The report was based on written evidence by 577 witnesses and more than 900,000 pages of documents.

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Failure-driven innovation from a Technology Perspective

by Anne L. Washington

The role of technology

Literature review

Innovation, failure and technology are closely related. Technology failure is inevitable as engineers continue to innovate and develop new products. This essay begins with definitions and continues with academic research that brings insight into failure-driven innovation from a technology perspective. Examples, drawn from the public sector, demonstrate the connection between technology and failure-driven innovation.

Failures can be unanticipated events, unexpected consequences or suboptimal performances that have critical negative impact such as material harm or loss of life. Failure often defines an unresolved condition that awaits a solution. A failure stands out as an exception to normal steady-state expectations and is defined here as an undesirable condition.

A conceptualization of failure is well-developed in the academic literature on information communication technology. A failure occurs when multiple errors or mistakes come together to cause a series of related negative outcomes. Perrow (1999) makes a distinction between an error and a mistake. A mistake is behavior that deviates from standard or anticipated action. It is possible to resolve a mistake through additional knowledge. An error is caused by the wrong assumptions. An engineering success is the avoidance of failure (Petroski, 1992, p5). Computer software and hardware research both emerged from the field of engineering. Engineers use details about fallen buildings or exploding machines to calculate how to build better objects (Petroski, 2006). Technology has relied on the same engineering ethos which is embodied in the phrase "Fail fast, fail early, fail often" (The Economist, 2011). Failure has long been a catalyst for technology innovation.

Technology failures can result from human problems, technical problems or a combination of both. The collapse of a bridge emphasized the need to test materials against rare

wind conditions (Petroski, 1992). The 1979 Three Mile Island nuclear energy accident started as a technical problem but was augmented by human failures (Perrow, 1999). The management at The National Aeronautics and Space Administration, NASA, did not consider engineering reports about the impact of weather before the space shuttle Challenger launch (Vaughan, 1990). While technology failures could be the result of material problems, the person who decided to use those materials may be blamed for the failure.

When technology fails, it sets off a series of cascading events. As Perrow (1999) indicates, failure builds if small concerns are able to grow without correction. When two teams collaborated on a satellite, the scientists failed to realize they were using incompatible measurement systems. The satellite was destroyed after it arrived on Mars (Stephenson, 1999). During the Gulf War, allied military personnel shot and killed each other due to information failures and technology incompatibilities on the battlefield (Snook, 2000). The United States Federal Bureau of Investigation, FBI, spent years building a multi-million dollar software system that was never completed and never used (Goldstein, 2005; Israel, 2012). If a solution could be found before there were negative outcomes, these events would not be considered failures.

Technology is viewed here as more than a static object but as a dynamic form that functions through social construction. Volti (2000) defined technology as the interconnected network of systems of knowledge. For example, a computer contains memory, a disk drive, software, an interface, as well as other parts. Each part is tied to knowledge systems and expertise as well as to each other. Because materials engineering is continuously updating the speed and size of electronic devices, technology also changes at a steady progressive pace. Software updates are coupled with hardware changes. Changing one component is seen as an overall innovation. For example, the introduction of a graphic user interface

was only one component change but was experienced as a radical new direction for computing. Technology has many interconnected parts and each part is constantly changing.

The academic literature on technology management reveals why failure drives innovation in technology. Specifically, three concepts bring insight into the conversation on innovation: disruptive technology, agile software development, and loose coupling.

Disruptive technology is an unanticipated innovation that drastically changes a market and industry. In fact, vonHippel (1994, 2005) found that a majority of innovations were developed by unsatisfied customers who then shared new ideas with manufacturers. Innovation is not always a new product or service. Innovation can be a new way of approaching an existing market (Schoemaker & Day, 2011). For instance, streaming video was a new business model that replaced VCR rentals. The research on disruption is a reminder that innovation can come from the failure of the status quo.

Agile software development, or agile, is an approach to writing computer programs. Agile, a series of adaptive methods, anticipates and welcomes failure (Beck, 2001). Its "lightweight" approach emphasizes continuous learning, changing conditions, functioning software, and iterative releases (Highsmith, 2009). Agile software development is in direct opposition to the traditional software development lifecycle (SDLC) where following formal procedures takes precedence over the quality of the object being created (Highsmith & Cockburn, 2001). The software is tested for function at the end, where agile software development constantly tests to avoid unanticipated dependencies. Agile identifies points of failure early in order to limit possible cascading problems.

Coupling is the degree to which elements are integrated together and move simultaneously. The concept of coupling determines whether a single mistake develops into multiple cascading failures. Perrow defines the cascading failure of coupled items as a "normal accident" (Perrow, 1999). Loose coupling implies significant independence so that if one item fails, others do not (Orton & Weick, 1990). Conversely, tight coupling, especially between human and technology systems, can lead to catastrophic failure. Organizations and technology systems are reliable when they are able to maintain loose coupling operations under a variety of complex conditions.

The case of information failures in combat provide examples of the concepts of disruption, agile, and coupling. The assessment of the terrorist attack on New York on September 11, 2001 identified government computer technology as a critical aspect for future security (National Commission on Terrorist Attacks upon the Unites States, 2004). Specifically, the inability to keep current with technology developments led to incompatible systems across agencies. Snook (2000) points to the complete lack of coordination between United States military services in the Gulf War. Completely uncoupled systems can also lead to failure because there is no mechanism for feedback or communication. The technology could only identify members of the same service such as the Army or the Air Force. The lack of interdependence and coordination between devices meant that the computers identified friends as adversaries. Inevitably soldiers killed other soldiers from the same side.

Failure in the technology industry can be caused by not moving forward. If the system does not run on the next operating system or software version, it will eventually fail. The FBI Virtual Case File, VCF, project is an example where the organization not only failed to innovate but its reliance on antiquated incompatible technology created a new level of risk (Goldstein, 2005).

Not surprisingly, many of the failures in the research literature are government projects where there is public scrutiny of finances and outcomes. Technology failures in the private sector are harder for scholars to examine but are no less frequent (Ross, 2002). The visible public sector struggles are the result of complex organizational change that accompanies converting bureaucratic structures into technology projects (Fountain, 2001). Public-sector organizations, who normally maintain procedures over long periods of time, must now constantly modernize to sustain their mandates.

Failure brings both unwelcome results and an opportunity to examine current practices. When framed as an opportunity, failure can lead to innovation and greater reliability. The 2001 New York City terrorist attacks altered how the United States handled national security technology projects. Three Mile Island sustained a series of failures that radically transformed the nuclear energy industry (Perrow, 1999). The space shuttle incidents changed space travel and technology management (Vaughan, 1990). The goal of good engineering is to avoid catastrophic accidents by planning to fail incrementally (Petroski, 2012). These examples show how failure can lead to innovations and improvements.

Failure and innovation are closely related in the technology industry. Technology, viewed as an interconnected set of systems, requires constant change. The technology perspective conceptualizes failure as an inevitable process that can be sufficiently anticipated, until the next change. Loosely coupled systems supported by agile software development anticipate the regular disruptions of technology innovations.

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Virtual failure: Never-Ending government technology projects

Case study

Context

The Federal Bureau of Investigation (FBI) investigates criminal activity and also has jurisdiction to investigate domestic terrorism. Its 2012 budget was $8.1 billion and it has approximately 36,000 employees. The FBI, a United States executive branch government agency, is currently divided into five main divisions, with over 50 national field offices and hundreds of additional sites.

An FBI investigation can be widely geographically dispersed. An FBI case is a set of material that captures individual events in the field and integrates them into an investigation.

Failure

The terrorist attacks of September 11, 2001 and the loss of thousands of lives caused the FBI and other government agencies to question what went wrong. The 9/11 Commission's final report specifically stated that the FBI needed to increase its analytic capability (9/11 Commission Report, 2004, p 401). At the time, an analyst who wanted to gather multiple cases together had to call agents, make requests, fax or possibly visit multiple offices. The goal was to have all case materials electronic. An analyst could compare cases entered in different offices and across different divisions.

An early modernization effort system, installed 1995, was the ACS Automated Case Support system. The ACS tracked standard paperwork forms. The FBI started a new computer project in 2000 called Trilogy. Trilogy was built to do three things: support agents, provide secure networks, and consolidate existing software.

In 2001, the FBI changed the scope of the Trilogy contract to the Virtual Case File (VCF) system. There were no requirements, defined architecture, or definition of completeness.

The VCF project did not rely on existing software code. The contractor was responsible for writing new code. The FBI did not have documentation of current work practices. Without guidance, the contractor conducted a wide-range of interviews to determine the current case workflow and incorporate it into the VCF. The new electronic workflow standardized practices across several groups and was perceived as changing existing workflows. In 2005, and 170 million dollars later, the VCF project was canceled.

Role of Leadership

The Inspector General and others outside of the technology group did not have easy to access the progress of the project. Managers in 2002, 2005 and 2010 reported that it was difficult to understand where the project was relative to deadlines. In addition, the leadership of the FBI changed several times over the course of the project.

This project was consistently approached at the highest level with an attempt to integrate all 122 existing forms, 40 application software programs, and 10 years of case data into one single new system. The Director's office received funding from Congress for a large scale technology project. In 2005, the external advisory recommended that the CIO build prototypes but the CIO chose to skip this step and build the whole system at once to meet funding obligations.

In 2006, a contract was awarded to create Sentinel a new case-management software system that would replace the VCF project. From 2007-2010, the project was run by contractors. In 2010, the FBI management ended the contract and asked the internal technology group to manage the Sentinel project.

Innovation & Transformation

The FBI technology group emphasized the need for agile computing. Agile computing is an approach to software engineering that anticipates and welcomes failure. In agile computing, the software is tested for failure at multiple points. Agile methods also provide ways for people to interact and respond to developments as needs change. In August 2012, the ACS was finally closed to new entries. ACS is still available for lookup inquiries because not all ACS data has been transferred to the new system. The Sentinel system completed testing and went into production in late 2012.

Data

This case study relies on data collected in formal inquires published between 2001 and 2012. The reports are based on internal governance reports as well as external hearings and witness statements.

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When innovators leave: internal and external failure

Case study

Six years after leading a worldwide transparency initiative in the financial services industry, the originating government agency has failed to leverage the innovation for themselves. What happens when innovators leave?

Context

The United States Securities and Exchange Commission (SEC) is an independent government agency that is responsible for regulating the securities industry. Regulations mandate information disclosure. The regulating agency subsequently publishes information necessary to confirm compliance. For instance, publicly traded companies must submit quarterly financial statements that are widely used to analyze the stock market. While essential for financial analysts, stockholders and investors, SEC reports are valuable for internal analysis and enforcement. According to one Senate Report (S. Rep 94-75 p79), institutional disclosure was intended to be used by the SEC to investigate how individual organizations impact the industry as a whole.

The SEC regulatory process largely involves company disclosure of information through the submission of forms. The Internet has transformed the mechanisms and the speed of this exchange. Since 1996, forms must be submitted electronically using the system called EDGAR, Electronic Data Gathering, Analysis, and Retrieval system. Because both stock markets and regulation are exchanges of information, data is an essential aspect of the SEC's work.

Leadership

Given the independent and political nature of commissions, SEC has more autonomy than other government organizations and is well-placed to test innovations. The Commissioner and the four-person commission are political

appointees chosen to represent both sides of partisan interests. In 2005, a new Commissioner recognized that reports would be more useful as electronic data for efficient oversight. The Commissioner actively engaged legal, technology and accounting professionals in addition to issuing requests for comments on the new rules. The results were a series of innovations geared towards efficiently gathering and understanding electronic financial statements. The Commissioner was able to fund the data innovations before leaving in 2009. The next Commissioner, representing a different political party, took office during the financial crisis and chose to establish a different set of priorities for the agency.

Innovation

In 2006, SEC commissioned an interactive data standard for financial reporting. Working with accounting professionals, they described a machine-readable language that makes it possible to do calculations and make text comparisons. This data standard called XBRL, eXtensible Business Reporting Language, provides spreadsheet-like characteristics to written reports. SEC joined the US Congress and the Government Printing Office, as leaders in using extensible semi-structured languages for modernizing government. Their analytic capacity surpasses text formats. Within a few years, the XBRL standard had became a staple with accounting professionals worldwide. XBRL was phased in slowly and by 2012 was a requirement for filing key SEC reports.

Transformation

The innovative qualities of XBRL startled the status quo both externally and internally. Externally, the financial services industry considered XBRL as an additional regulatory burden. Instead of integrating the data standard into existing computer systems, financial statements continued to

be audited as they were before. The audited financial statements are sent to outside XBRL expert vendors for conversion. While both files are submitted to the SEC, there are no systematic checks for accuracy, much less any assurance that the XBRL and the report are equivalent. All files are accepted at submission including those with obvious mistakes such as missing fields, incomplete data or math errors.

The internal reaction to XBRL was unenthusiastic and the project fizzled after the Commissioner left in 2009. The SEC Investigator General (IG) found that when no one was given explicit jurisdiction over data, each department assumed that another was handling it. By the time XBRL was required for submission for all quarterly reports, no one at the agency had an incentive to use it; therefore no one was concerned with its quality. The IG also found that SEC was failing to meet its goals because it did not provide employees with proper tools for analyzing the increased workflow. For example, one observer saw an employee use a calculator to check whether the numbers on the screen came to a correct total. In a 2013 survey, SEC employees identified an organization culture of blame and distrust instead of cooperation and autonomy. Communication was stalled between hierarchical levels and between departments. This made it difficult to detect the growing interconnected scandals that became the financial crisis.

Failure

With only the regulated companies monitoring the data, the extensibility of the standard XBRL tags grew out of proportion. For example, instead of using the standard tag for revenue, companies would add a company-specific revenue tag making it impossible to make comparisons. A 2012 Columbia University report found that the XBRL data quality is perceived by investors as unreliable.

Despite EDGAR now being free to the public, few individual investors have the skills to download, parse and integrate the data for comparisons. Many third-party companies provide those services, at a considerable cost, adding yet another layer of meaning.

Finally, taking advantage of XBRL requires what one former employee called "the triple threat". This rare person is comfortable with technology standards, is familiar with accounting rules and has an understanding of the financial markets. Like any translation process, ideally the translator is fluent in all languages and is able to catch any problems in interpretation.

The SEC innovation focused solely on establishing the data standard and failed to consider other aspects necessary for the use of the data. While initially poised to quickly make the transition from documents to data, the agency fell behind others. The SEC procedures are still geared towards slower rates of submissions in formats that invite visual instead of machine-readable analysis.

Data

This case study is based on interviews, Congressional hearings, and reports from government investigations.

Further Reading

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Project Background

The Peter Pribilla Foundation was founded in July 2005 by Hannelore Pribilla as part of the corporate body of the Technische Universität München (TUM). The foundation – in honor of Peter Pribilla, former member of the Executive Management Board of Siemens and one of TUM's most influential corporate partners – supports research and teaching in the fields of innovation and leadership. In recoginition of Peter and Hannelore Pribilla's many contributions in research, teaching and administrative advice, the foundation is committed to support early career leaders who are influencing innovation and leadership in ways that follow the footsteps of both founding pioneers.

Between 2009 and 2013 the Foundation supported more than 17 different research projects of young academics in the field of leadership and innovation. Failure–driven Innovation was a project that aimed to research, unpack and disseminate a set of in depth-case studies that would make failure experiences visible for innovation management teaching, show the mechanisms that link failure experiences to innovation, and describe the facilitating role of leadership in this process. The team members disseminated their research in presentations at leading conferences (e.g. Academy of Management, International Society for Professional Innovation Management, Public Management Research Association, Strategic Management Society, European Association of Work and Organizational Psychology), invited talks (e.g. ideasUK Foundation, Falling Walls Conference, Usability Professionals), in various journal papers (e.g. International Journal of Innovation Management, Journal of Product Innovation Management, Schmalenbach Business Review) and books (Springer).

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Failure-Driven Innovation

The book deals with failure as a source of innovation. It encompasses 5 perspectives: strategy, network, process, learning and technology. Each author gives a literature review followed by two individual case studies. The case studies cover manufacturing, construction, health care, public safety and government. Thus, the reader gets a comprehensive overview illustrated with real-life examples.

The book is suited especially for higher-education research and teaching. Students of different disciplines can analyse how failure is caused and how to deal with it. Furthermore, the publication serves as a learning resource for managers and consultants. It can be used to create a better understanding of how failure drives innovation.

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