The Faith-Factor in Design Thinking: Creative Confidence Through Education at the Design Thinking Schools Potsdam and Stanford?

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Abstract In this chapter, we discuss the idea of "creative confidence" as an objective of design thinking education as taught at the design thinking schools in Potsdam and Stanford. In brief, creative confidence refers to one's own trust in his creative problem solving abilities. Strengthening this trust is a main goal of the education at the design thinking schools. However, there have been only few efforts to develop the concept of creative confidence in design thinking on a deeper and measurable level. To substantiate this discussion, we will compare creative confidence with the concept of self-efficacy and discuss this in the context of the education at the design thinking schools.

1 Introduction

The dominant role of expert knowledge as a resource for professional problem solving has come more and more under pressure since the rise of the information age. The increasing complexity and wickedness of problems we are faced with in our professional lives call for creative and empathic problem solving skills that apply not only a "scientific" knowledge base, but also a generally widespread understanding of various knowledge domains beyond one's own profession. For instance, project-based and multidisciplinary team work as a popular means in the corporate world asks for a greater ability and awareness of sharing and learning

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knowledge from other professions as well as from various stakeholder domains. Skills that help to learn and to transform unfamiliar kinds of knowledge become likewise important for problem solving as skills to apply already internalized knowledge. The question is how companies and employees can attain and maintain these forms of problem solving abilities that lie beyond mere professional training.

Design thinking methodology as taught in at the design thinking schools in Potsdam and Stanford aims at fostering such abilities of meta-professional learning and creativity. "Design Thinkers" are trained in understanding and creatively transforming cross-domain knowledge as well as integrating different expert domains in creative problem solving processes. A core claim of design thinking education is to build up a person's trust in tackling problems of which you rather know what you don't know than what you actually know: This trust in one's own creative capability within a uncertain setting is what we call *creative confidence*. The importance of creative confidence in design thinking has been made clear by David Kelley (2010), founder of the design agency IDEO and one of the "fathers" of design thinking education, by stating that design thinking rather evokes creativity than creating it:

> To me, design thinking is basically a methodology that allows people to have confidence in their creative ability. Normally many people don't think of themselves as creative, or they think that creativity comes from somewhere that they don't know—like an angel appears and tells them the answer or gives them a new idea. So design thinking is hopefully a framework that people can hang their creative confidence on. We give people a step-by-step method on how to more routinely be creative or more routinely innovate. (. . .) And design thinking is basically a method that allows people to have confidence in their creative ability. (Interviewed by Carl von Zastrow 2010)

Also, Rauth et al. (2010) identify through an interview-based study creative confidence as the main learning d.school teachers want to teach. According to the authors, methods, process models and working modes are not seen as a means to foster directly innovative products, but mindsets fostering creative confidence.

However, the questions remain open as to what precisely creative confidence is, that is, how can it be conceptualized, and in which ways design thinking education can reach this goals of fostering it. In this paper, we will address these questions in connection with Albert Banduras concept of self-efficacy. Although the term creative confidence is only vaguely defined, there seems to be a strong similarity with the concept of self-efficacy. Bandura defines self-efficacy as follows:

> Perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments (Bandura 1997).

Self-efficacy therefore supplies the necessary conditions for taking action under risk. If we don't expect success, we will not act or take risks. The same is basically true for creative confidence: If we approach a creative problem without substantiated optimism, it is unlikely that our project will end up being successful. Successful problem solving therefore is not only a result of the amount of knowledge a person has already internalized, but, as Bandura puts it, of *belief*:

> Beliefs of personal efficacy constitute the key factor of human agency. If people believe they have no power to produce results, they will not attempt to make things happen (Bandura 1997).

This statement has fundamental implications, meaning that even if we are able to implement a required action we already know about, we will perhaps not do it because we believe that we lack the necessary capacity to succeed. Bandura puts that as follows:

> People's beliefs in their efficacy have diverse effects. Such beliefs influence the course of action people choose to pursue, how much effort they put forth in given endeavors, how long they will persevere in the face of obstacles and failures, their resilience to adversity, whether their thought patterns are self-hindering or self-aiding, how much stress and depression they experience in coping with taxing environmental demands, and the level of accomplishments they realize (Bandura 1997).

This clarifies that self-efficacy beliefs influence many motivational, action lead-ing, cognitive and affective processes of a human being by mentally anticipating goal-focused learning processes and estimating their own competence in sufficiently coping with a situation (see also Satow 2002). Self-efficacy therefore can be seen as a crucial precondition for coping successfully with complex challenges in the most diverse fields, regardless of the real individual level of skills.

However, Bandura defines self-efficacy as a general and non-area-specific con-cept and thus as applicable to diverse situations and indicates therefore that self-efficacy beliefs might vary regarding specific areas. A person, for example, can have a high self-efficacy in an academic context, but the person may have low performance in sports or socializing. This may be the reason why the concept of self-efficacy has been also applied area-specifically, in particular in the field of creativity by, among others, Tierney and Farmer (2002). In this context, the concept of *creative self-efficacy* came up, as stated by Tierney and Farmer (2002):

> Working from Bandura's general definition of self-efficacy as targeted perceived capacity, we defined creative self-efficacy as the belief one has in the ability to produce creative outcomes. (Tierney and Farmer 2002)

Against this background, we suggest that the construct of self-efficacy can be used to conceptualize creative confidence in the context of education at the design thinking schools in Potsdam and Stanford. If this assumption turns out to be valid, it would open new perspectives on further research on education at the design thinking schools in Potsdam and Stanford: Bandura's construct of self-efficacy is already operationalized and would allow us to employ validated measurements for the success of education at the design thinking schools. Main similarities between both concepts suggest the soundness of this assumption:

– The base of both terms, creative confidence and self-efficacy, is that people need beliefs in their own capacity before they are able to activate it to the best of their potential.
– Self-efficacy is related to the routine performance of tasks and exercises that generate beliefs through experience. Also education at the design thinking schools aims at generating creative confidence through routine application of
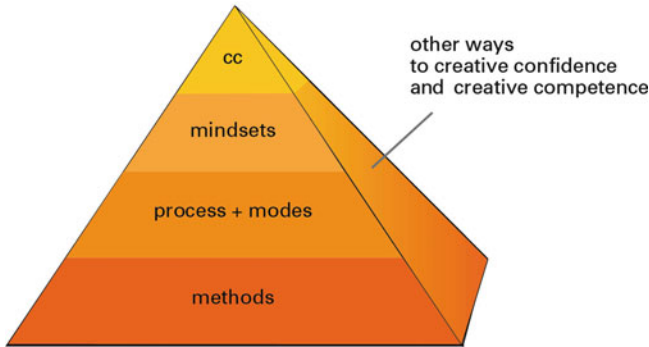
Pyramid Model *by Rauth, Köppen, Jobst, Meinel (2010)*
The development of creative confidence and creative competence (cc) through design thinking and other disciplines.

Illustration 1 Pyramid model (Rauth et al. 2010)

methods, process steps and working modes within complex problem settings (see Illustration 1).

However, in spite of these similarities, to further substantiate the connection between self-efficacy and creative confidence in design thinking education, we have to discuss the parallels between both concepts in greater detail. In order to do so, we will depict in the following what sources of self-efficacy Bandura describes and discuss in what way they can be found in design thinking education.

2 Sources of Self-Efficacy

Bandura performed research on how self-efficacy originates and which factors have an impact on self-efficacy. He identifies and describes four sources of self-efficacy. In the following, we will illustrate these sources and then, connecting them to creative confidence, we transfer the sources into the design thinking schools in Potsdam and Stanford by interpreting our explorative observations. Our aim is to check if there are situations and conditions in the design thinking schools in Potsdam and Stanford, which will show that the mediation and enhancement of self-efficacy at the design thinking schools is plausible. The goal of our comparison is therefore to reassess carefully if we find evidence for using the construct of self-efficacy as a synonym to creative confidence in the future.

According to Bandura, the self-efficacy of a person originates from four sources of information: (1) enactive mastery experience, (2) vicarious experience, (3) verbal persuasion and (4) psychological and affective states. In the following, we will compare these four sources with explorative observations at d.schools. Our comparison will adjust each of the four sources separately with at the design

thinking schools in Potsdam and Stanford situations in order to find out more about potential parallels and differences.

2.1   *Enactive Mastery Experience*

Following Bandura, acting out and mastering a difficult task is the first and most efficient way that leads to self-efficacy. Situations that offer direct experiences therefore are a good way to achieve a stronger belief in one's own capabilities. Bandura calls such experiences "mastery experiences" and claims that:

> Successes build a robust belief on one's personal efficacy. Failures undermine it, especially if failures occur before a sense of efficacy is firmly established. (. . .) After people become convinced that they have what it takes to succeed, they persevere in the face of adversity and quickly rebound from setbacks. By sticking it out through tough times, they emerge from adversity stronger and more able (Bandura 1997).

Also, Bandura points out that even small successes can help people to believe in their own capability to master future tasks or new activities in settings that are uncommon for them (Bandura and Rachman 1978). We therefore asked ourselves: What kinds of difficult situations are posed to students at design thinking schools to be successfully mastered? Which methods are mediated and will empower students to deal successfully with difficult and challenging tasks in the future?

In design thinking education, students get to know the methodological design thinking process by repeating the methods during several so called "design challenges". These design challenges are real projects, which are handed in by project partners. Oftentimes, project partners have different places of origin and come for instance from business or social organisations. But in all cases they hand in a project that has to deal with complex or "wicked" problems (Rittel and Webber 1973). Dealing with ambiguity and wickedness of problems is therefore a main skill that has to be trained during the course of a design thinking education. Finding solutions for wicked problems does not seem to be a promising way for "small" successes that can be easily achieved, as claimed by Bandura. What tools are being delivered by the design thinking education in order to establish creative confidence within students?

We could observe some crucial aspects of methods that may help students to feel more creative and confident. For example, they learn to apply research methods such as interviewing and observation to better know the user and his needs: They learn how to ask and how to observe the user in order to gain empathic knowledge about the user that he himself does not know about or what he cannot elucidate himself. Students then develop a working hypothesis regarding the user's needs, building on the findings and insights of their research. In this phase they develop drawing skills and brainstorming techniques. These ideas from the brainstorming phase are being refined as solution proposals and are made tangible as prototypes. In this way, developing prototyping skills also comes along with the design thinking education.

Throughout the project, students are enabled by several mediated techniques and the knowledge of how to apply these techniques. If we compare our observations with Bandura, we can assume that these techniques help the students to enlarge their problem perspective and to deal confidently with ambiguities within the design challenge. The design thinking methods are tools that are easily achieved and lead to moments of success within the team – the success in problem solving within projects may therefore enable the enhancement of creative self-efficacy.

Bandura also stresses that mastery experience attributes need to be ascribed to one's own capabilities or one's own learning engagement if self-efficacy is to be established. The next question therefore is: What mirrors to the students that the accomplished action was successfully done?

We found that each process step or mode should be shown in a presentation that is open to feedback from the other teams. We could see that the students learn via their presentations and via the given feedback that they are able to solve tasks in a desirable way for the project partner. Consequently, they are more self-confident when it comes to the final presentation in front of the project partners. We could see that the students feel appreciated by these external partners, who are often well-positioned people in an organization. This is an important form of success that comes along with a design challenge. It may even happen that project partners offer concrete jobs to students at the end of a project or that a company financially support a team of alumnis to continue their work on the idea in order to introduce this idea onto the market. Another form of direct success can occur in the form of patents and awards.

Summing up, we assume that design thinking students are in a better position to aquire positive master experiences compared to classical university students. This may be so due to their concrete project experiences including particular familiarity with process models and methods, their teamwork, their specific learning environment and the support of design thinking teachers. According to Bandura, these positive mastery experiences lead to heightened self-efficacy.

2.2   Vicarious Experience

Drawing conclusions about one's own competences are possible when the individual watches other people, for instance models during their acting. The so called "vicarious experience" or "social learning" means that knowledge and cognitive and social skills on the one hand can be acquired by solving problems in teams or on the other hand by watching successful behavioral models, which due to different accounts (insistent effort, effective assignment of learning strategies) can deal with difficult problems and demands. As Bandura describes it:

> The greater the assumed similarity, the more persuasive are the models' successes and failures. If people see the models as very different from themselves, their beliefs of personal efficacy are not much influenced by the models' behaviour and the results it produces. Self-modeling, in which people observe their own successful attainments achieved under

specially arranged conditions that bring out their best, is directly diagnostic of what they are capable of doing.

We assume that students at the design thinking schools are rather similar in their interests (e.g. having an interest in design-oriented approaches). Similar interests also increase identification within teams and therefore enhance social learning as described by Bandura. Apart from having similar interests, the students come from different backgrounds. Due to different study fields, the students expand or obtain different skills, special knowledge, various working methods and other perspectives. A core part of design thinking education is to learn to treat these various knowledge and ability domains complementary and to be open to learning from others. There is therefore very little individual competition in design thinking schools. The attitude of helping each other within and between teams predominates. Teams do not focus on competing with each other but on solving complex challenges and delivering satisfying results.

According to our observations, the diverse teams develop a feeling for the different backgrounds and skills during a project quite well. A psychologist in a multidisciplinary team might bring in his skills to depict mental models and needs of users comprehensively while a product designer might be the only one able to create concept sketches in a fast and comprehensive way. The more they identify themselves with their team members, the better they start to complement one another intuitively. At the design thinking schools in Potsdam and Stanford a team member therefore constantly has experiences that he alone never would have had: experiences of communication, visualization, structuring contents, organisation, risk taking, manifold learning etc. He learns how to observe others – his team members, users, stakeholders – and likewise how it is being observed. Due to the distribution of competences, expertise, skills and ideas among the students, every single one of them moves in a steady flow of vicarious experiences.

Thus teachers are not only instructors of the method but models to the students, as well. They are often involved in design thinking projects and present their results to the students. In comparison to other forms of teaching, the design thinking schools in Potsdam and Stanford are characterized by an open atmosphere also concerning the relationships between teachers and students. Since teachers are not judging or evaluating the students, they can act as advisors, models, sometimes just cocreators that give useful hints. According to Amabile (1996b) the creativity is enhanced additionally if one works together with a "coactor" that reflects the team's or individuals creative outcomes. Teachers as "coactors" therefore serve as a source for vicarious experiences as well. Also the use of open spaces and flexible working and communication surroundings like mobile furnitures and communication supports this process of constantly observing others as models in action in order to reflect their own actions.

To sum it up, vicarious experiences are made in at the design thinking schools in Potsdam and Stanford in various ways. The students learn complementary skills, working methods and behaviors by watching their fellow students and teachers. The

d.schools have well functioning and flexible premises, which create free space to bring forward cooperative communication and therefore supports social learning.

A particular culture is promoted which implies small teams with teachers monitoring and supporting the students throughout the entire processes and providing feedback, without judging them too early. This particular atmosphere can be regarded as a class climate which enforces learning. We are convinced that it will affect self-effective expectations in a positive way.

2.3   Verbal Persuasions

A further important source for the development of self-efficacy expectations (auto-suggestion: "You can make it!") refers to verbal feedback or verbal persuasion. Verbal persuasion means that one persuades someone of being capable of doing something in a successful manner. Verbal feedback provided by another party is especially helpful and effective if it occurs task-related and promptly and if it shows realistic consideration of the actual level of skills, abilities and the performed learning progress of the team members (see Kutner 1995; Schwarzer and Jerusalem 2002). Not only the verbal persuasion by other people is effective, but also one by one's own inner voice. The so-called "self-instruction" belongs to this source of self-efficacy as well. As Meichenbaum (1985) describes it, self-instruction and self-verbalization are two of the prominent methods in psychology and specifically in behavioral therapy. They have proven to be valid concepts for handling stressful or frightening situations.The emphasis on self-instruction is placed on the meaning of the conviction of the own capacity for acting ("I can do it!", "I have the right to do so!") and is therefore related to the encouragement of self-efficacy. As puts it:

> People who are persuaded verbally that they possess the capabilities to master given tasks are likely to mobilize greater effort and sustain it than if they harbor self-doubts and dwell on personal deficiencies when difficulties arise. Bandura (1997)

There is a high degree of mutual support and motivation in design thinking teams. Through the use of motivation techniques, an atmosphere of constructive feedback and an attitude towards failure as a means for learning, there is generally a low level of fear and a high level of optimism. For instance, "fail early and fail often" is one of the key paradigms in design thinking and requested and welcome as a chance for further learning. Within the process and the course of the project there exists informal and encouraging feedback at all times. Speaking out of experience, a strong belief in the capabilities of a design thinking team generally goes along with an attitude of "Yes, we can do it!"

Also, the design thinking school environment offers strong social support, in particular through the teachers. At least one teacher is assigned to every design thinking team. He or she mentors and accompanies the students throughout the whole process and during the entire period of the project. If required, the teacher passes the team through certain project phases and intervenes if the process

stagnates or if methods are applied incorrectly or in an unhelpful way. If a team does not get along well within the process and makes no progress or is not capable of changing this status, the teacher joins in and supports the team in passing the actual process phase by asking the aim oriented questions, reflecting on the situation and by giving the team further methods to continue with. Moreover, some teachers actively participate in presentations (e.g. they take over a role within the role play). Other teachers also take part in activities outside the regular lessons. In this way, the teachers act as guides providing the team with a feeling of backup throughout the process.

2.4   Physiological and Affective States

Physiological and affective states as well as physical arousal are expressions of the perceived belief in one's own self-efficacy and influence one's expectancy of self-efficacy. Self-efficacy is also influenced by the observation of one's own emotional states while a person thinks about a certain task or tries to solve a problem.

> People often read their physiological activation in stressful or taxing situations as signs of vulnerability to dysfunction. Because high arousal can debilitate performance, people are more inclined to expect success when they are not beset by aversive arousal than if they are tense and viscerally agitated. Stress reactions to inefficacious control generate further stress through anticipatory self-arousal. By conjuring up aversive thoughts about their ineptitude and stress reactions, people can rouse themselves to elevated levels of distress that produce the very dysfunctional they fear.

In the design thinking schools in Potsdam and Stanford, every day starts with so-called "warm-ups" to relax the team members. Since Jacobson (1938) we know that activity in the central nervous system influences the muscular tension and vice versa. That means, psychological strain goes along with an increased tonicity, but, on the other hand, warm-ups also lead to the relaxation of the musculature and contribute to mental stress relaxation (Esser Göggerle and 2008).

Even through the warm-ups in the design thinking schools do not seem to be specifically focused on relaxation training and mental relaxation, one can assume that these practices contribute to a decrease of nervousness and stress and negative or disruptive thoughts and feelings take a back seat.

The following tasks and challenges may be accomplished more easily with this state of mind. A heightened dumping of endorphin additionally leads to individual satisfaction and enhancement of motivation.

Not only are relaxation and the reduction of pressure important consequences of physical exercises – at the same time the common acting within the group seems to heighten a certain "we-feeling" and team spirit.

In addition, warm-ups are created in a way that small tasks have to be performed. Because of the low complexity factor of these tasks (e.g. "create a new greeting procedure and greet your neighbor with it") the participants gain a feeling of success

right from the beginning. This provides relaxation but is also a convenient contrast to the many small failures the teams will have to face in their projects.

We can summarize that the fourth source of self-efficacy can only be conveyed indirectly by the design thinking education. Nevertheless, the design thinking schools uses warm-ups that can lead to a decrease of stress reactions. Within a comfortable atmosphere, with moments of success and social support from the other group members, negative affective states will occur more infrequently. We therefore assume that this fourth source of self-efficacy is nevertheless being addressed by the design thinking schools and that it has got a positive influence on the self-efficacy of the students.

3 Conclusion

In this paper, we explored whether the concept of creative confidence in the education at the design thinking schools in Potsdam and Stanford can be conceptualized by Bandura's concept of self-efficacy. We thereby compared Bandura's concept of four sources of self-efficacy with key aspects of the design thinking schools. It has been shown that compared to rather traditional forms of learning and education it is more likely that students achieve positive mastery experiences in an easy way. Also students at the design thinking schools are supported by social learning, constant feedback by the teachers and other students as well as a constructive atmosphere. The focus on physical exercises such as warm-ups in the d.school context that are performed by the team, also led to the conclusion that stress reactions and fearful moments are decreased on a physiological base.

In summary, all four sources of self-efficacy proposed by Bandura can be found in core aspects of d.school education. We therefore conclude that the concept of creative confidence as a main goal to be taught at d.schools can be – at least to a high degree – conceptualized through the self-efficacy construct. Both creative confidence and self-efficacy refer to one's own trust in his creative problem solving abilities and are built upon the idea that successful experiences will have positive effects on future challenges. We acknowledge the specific context of creative confidence in design thinking schools. Therefore we assume that Tierney and Farmer's (2002) definition of creative self-efficacy can be regarded as a promising starting point to further explore the impact of design thinking on the teams' attitudes and behaviours. However, this does not mean that Bandura's concept does completely define creative confidence in the design thinking schools. There are probably more factors to consider like personal educational backgrounds or task-related issues. Nevertheless, the parallels between both concepts are salient and future research on the effectiveness of design thinking schools should take this into consideration.

4   Outlook

Creative confidence is an objective of the design thinking schools in Potsdam and Stanford and an important skill for future generations of students. Design thinking education intends to mediate this capability next to other crucial skills such as "wicked" problem solving and empathic learning abilities. In order to investigate the actual effects of design thinking education, it seems to be promising to use the construct of self-efficacy as a means of measuring the amount of creative confidence students gain through design thinking schools courses. Our goal therefore is to design a research framework drawing upon the already validated measurements of self-efficacy.

We have already completed some pilot studies and gained some first quantitative and qualitative data. The insights from the data and the current comparison of Bandura's sources at the design thinking schools in Potsdam and Stanford support our assumption that design thinking schools in Potsdam and Stanford conveyes creative self-efficacy. We presume that the effects and factors of self-efficacy are the same as for creative self-efficacy. In the framework of a larger research project, we will evaluate empirically if design thinking schools mediate creative self-efficacy and if so, what influential factors can be observed. We hope to better understand the mediation of this skill to be able to give suggestions for the design thinking education as well as for the development of creative confidence in other contexts.

References

Amabile TM (1996b) Creativity in context. The social psychology of creativity. Boulder, Colo.; Oxford: Westview Press

Bandura A, Rachman S, (1978) Perceived self-efficacy: analyses of Bandura's theory of behavioural change. Oxford, Eng.; New York, N.Y.: Pergamon Press

Bandura A (1997) Exercise of control. W. H. Freeman and Company, New York

Esser G, Göggerle S (2008) Lehrbuch der klinischen Psychologie und Psychotherapie bei Kindern und Jugendlichen. Georg Thieme Verlag

Jacobson E (1938) Progressive relaxation; a physiological and clinical investigation of muscular states and their significance in psychology and medical practice. Chicago: Univ. of Chicago Press

Kutner L (1995) Die Bedeutung der Selbstwirksamkeit für die Anpassung Jugendlicher an den gesellschaftlichen Wandel. In: Edelstein W (eds) (Hrsg.) Entwicklungskrisen kompetent meistern. Der Beitrag der Selbstwirksamkeitstheorie von Albert Bandura zum pädagogischen Handeln, Heidelberg, pp 74–84

Meichenbaum D (1985) Teaching thinking: a cognitive-behavioural perspective. In: von Segal JW, Chipman SF, Glaser R (eds) Thinking and learning skills: research and open questions, vol 2. Lawrence Erlbaum Associates Inc., Hillsdale, pp 407–422

Rauth I, Köppen E, Jobst B, Meinel C (2010) An educational model towards creative confidence. In: 1st Proceedings of ICDC, Kobe

Rittel HWJ, Webber M (1973) Dilemmas in a general theory of planning. Policy Sci 4(2):155–169

Satow L (2002) Unterrichtsklima und Selbstwirksamkeitsentwicklung. In: Jerusalem M, Hopf D
    (eds) Selbstwirksamkeit und Motivationsprozesse in Bildungsinstitutionen. Beltz, Weinheim
    (Zeitschrift für Pädagogik, Beiheft; 44), pp 174–191
Schwarzer R, Jersusalem M (2002) Das Konzept der Selbstwirksamkeit. In: Jerusalem M, Hopf D
    (eds) (Hrsg.) Selbstwirksamkeit und Motivationsprozesse in Bildungsinstitutionen. Weinheim,
    pp 28–53
Tierney P, Farmer SM (2002) Creative self-efficacy: its potential antecedents and relationship to
    creative performance. Acad Manage J 45(6):1137–1148
von Zastrow C (2010) New designs for learning: a conversation with IDEO Founder David Kelley.
    http://www.learningfirst.org/visionaries/DavidKelley. Accessed 5 Nov 2011