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INCREASING THE ENTREPRENEURIAL SUCCESS OF DESIGN SCHOOL SPIN-OUTS

ABSTRACT
Universities and Design schools prepare graduates in the principles of product development, through bachelor's courses in Product/Industrial design and Business. Through the course of a typical design school education the graduate will have developed skills in research, idea generation and design thinking methodologies to support the development of Final year project (FYP). The business school graduate will similarly undertake a FYP to showcase the accumulated skills from the degree course. The typical FYP will produce the first embodiment or business plan of the new design/business proposal, expressed through the academic requirements of the design/business school. The requirement at undergraduate level generally does not include preparation for spin-out albeit many projects may embody many the characteristic developments necessary. This research will trace the project development stages from initial briefing towards spin-out, focussing on the study of entrepreneurial methodologies and philosophies as observed through case-studies projects from business school, design school and entrepreneurs independent of college structures. The focus of the research will be to discern the characteristic philosophies and methodologies with particular interest in 'causal' and 'effectual' thinking as observed in the development process.

Keywords: Causation, Effectuation, spin-out

1 INTRODUCTION
This research will contribute to design education by studying a number of case-study attempts to spin-out, following graduation from design and business schools. A comparison with start-up attempts from outside academia will be made following similar case-study research. It will endeavour to learn from their spin-out experiences observed to develop an understanding of the philosophies and methodologies at play during spinning-out development, with a view to proposing an educational strategy for fostering successful spin-out development. The application of the proposed educational strategy towards successful spin-out will be outlined later in the research schedule. This paper will focus on the pilot case-study to determine the 'causal' and 'effectual' thinking and the extent to which it is used.

2 MATERIALS AND METHOD
Aims:
- Through an inductive exploration of actors in the field of design-led product development, the research will investigate the spin-out and start-up activities of a case-study project – "Product A".
- A series of semi-structured interviews with the Case-study spin-out companies will identify the methodologies and philosophies of the development paths
- A review of the literature will be undertaken to explore the methodologies and philosophies that are representative of contemporary product development in the field of product development and subsequent spin-out
- Through a study of a number of case-study company's, Causal and/or Effectual (or the extent to which it is both) approach to development will suggest an approach to a successful development process based on an accumulated examination and analysis of the accumulated case-study data

3 LITERATURE REVIEW

As the design-led project in question is associated with a final year graduation project, brought towards business development after completion of the bachelor's degree, the design school methodologies and philosophies should be evident through the projects. The area for examination will be evaluated through Causal and Effectual thinking. While the two styles of thinking align roughly along traditional business school and design school philosophy and methodology respectively, a duality may be evident in practice. A study of the literature follows to explore contemporary product development thinking.

Prediction and control of the environment of product development may often be possible depending on the development phase in question, but, the early development phases are often characterised by a high level of chaos, Koen et al, (2001). It differs from the New Product Development (NPD) process of solving a problem through innovative steps and stages that from the beginning are quantifiable and documentable and rely on prediction and goal setting, (Cooper and Klienschmidt, (1987), Brown and Eisenhardt, (1995), Griffen and Page, (1996). This early phase is commonly referred to as the "fuzzy-front-end", (Koen et al, 2001; Khurana & Rosenthal, 1988; Kim & Wilemon, 2002) and is described as the time between the initial conception of the opportunity or idea and the state of readiness in development for design, engineering, manufacture and introduction to market.

Koen et al. (2001) discusses five (fuzzy) front-end elements to pre-development: 1. Opportunity Identification, 2. Opportunity Analysis, 3. Idea Selection. He suggests a methodology based largely on ethnographic primary research, and that much of the foundation for the methodology is myth and extrapolation from existing customer experience. This can be contrasted with a purist effectual method where there are no assumptions of predetermined market or user but relies on the actions of the entrepreneur resulting from new developments presented. Rational - Preserving the Status quo v Emotional - challenging the status quo.

In comparing the character traits of "efficient" versus "innovative" people in business, Von Stamm recognises that a combined approach that utilises both phenotypes is more likely to survive and to innovate. While an over dependence on the "efficient" will tend towards conservative practice and stifle innovation, the opposite is true of over-reliance on the "innovative" will tend towards unstructured development practice (Von Stamm, B, 2003/8).

> Type A ('Efficient'): Attention to detail, present oriented, needing clarity and predictability, numbers driven, tight control, repetition,   standards and procedures, failure = disaster
> Type B ('Innovative'): Bigger picture, future oriented, accepting of (initial) ambiguity, uncertainty, visual, concept driven, autonomy, experimentation, open-mindedness and flexibility, failure = learning

She draws a relationship with designers as people with "an innovation-conducive mind-set" and discusses their propensity to experiment and deal with the uncertainty - "fuzziness". She defines 'design' as "the conscious decision-making process by which information (an idea) is transformed into an outcome. She goes on to say that "it is about exploring and experimenting, the core of innovation"

Tim Brown, the CEO of IDEO places design thinking at the centre of the innovation process, stating: "Design thinking is a human centred approach to problem solving. It is a process built from people (inspiration gained by looking and listening to them), prototyping (ideating quickly to make things real), and stories (getting things implemented by selling compelling narratives not 'concepts')".

Embodiment of the solution through product design may be dependent on a process with repeated iterative divergent and convergent loops resulting in the optimum solution (Buijs, 2003). The environment of the development process depends on an empathetic connection to the 'user', a human-centred design approach. Traditionally, a large design phase would result in the product offering and an introduction to the market. Product testing (probing and learning), beyond the design team and

company environment verifies the process (market testing phase). Unless tested the process may rely on the validity of the research phase to determine the product market assumption.

Causal reasoning identifies a specific goal and an approach towards achieving this goal. Causal reasoning describes the classic NPD philosophy where the central premise is that "if I can predict the future (typical business plan) I don't have to control it". From a Causal perspective the development process applies a series of predicted stages in a plan, which includes the design phase, that assumes an outcome based on a perception of market 'needs'. The plan then acts as a roadmap/guide to control the environment and allow the development of the product for the identified market.

Effectual reasoning can be seen as the opposite of causal reasoning – "if I can control the future I don't need to predict it". This reasoning drives entrepreneurial success where, starting with only a set of 'means' (who I am, what I know, what I possess, etc.) and the process of deploying them, goals gradually emerge (Sarasvathy, 2001).

Four basic principles of Effectuation according to Sarasvathy;
"Bird in the hand principle" - Start with recognition of your means
"Affordable loss principle" – Determine what an 'affordable' loss rather than the attractiveness of the predictable up side
"Lemonade principle" – Embrace surprise from uncertain situations – remain flexible rather than stuck to existing goals
"Crazy quilt principle" – Form partnerships with a shared view of creating the future product, firm or market – don't worry so much about competitive analysis and strategic planning

Kraaijbrink, (2008) suggests that the two models are the extremes of the entrepreneurial behavior and focuses on the differences between the two models to arrive at an objective and balanced view. He argues that neither model should be exclusively connected to pragmatism or the entrepreneurial process. He suggests that the linear (teleological) causal model is more useful in existing products and markets that suggest incremental innovation and the (pragmatist) effectual model is more suited to the new product markets where the environment is characteristic of discontinuous innovation.
Causation model: Ends are given; prediction means controllability, consideration of expected return, suitable for existing products and markets, views outside firms as competition and is a linear model
Effectuation model: Means are given; controllability reduces need to predict, consideration of affordable loss, suitable for new products and markets, view outside firms as potential for partnerships and is a cyclical model.

4 ANALYSES
Initiating a project in product development according to the academic demands of the Final Year Project (FYP) using the principles of 'Human-centred design' (Kelly, IDEO), the student selected the 'field' for attention and through ethnographic principles and practice identified the 'problem' to address.

Through an analysis of semi-structured interviews with the graduation project spin-out, an account of the development path is presented below. For the purposes of this paper the case-study pilot project will be referred to as 'Product A". An analysis of 'causal' and 'effectual' thinking as outlined by Kraaijbrink follows a chronological review of the case-study development path. It uses a coding strategy to identify 'causal' or 'effectual' philosophies and methodologies used.

Development stage description: Project selection
"It was through a process… there was that 3 months of time to find the problem"   **Causal characteristics:** *Seeking to find the problem to define the approach and plan for future*

Effectual characteristics:

Development stage description: Problem definition
"I found that there was nothing for the 'need'… everyone has that problem learning the 'need' It became very clear, 3 if not 4 things that it had to be; human form, movement, resistance, challenging and educational"   **Causal characteristics:** *Found through causal process of ethnographic research (academic requirement) – Open ended, objective and interpretive*
"It was just a gut thing telling me…"   **Effectual characteristics:** *Reliance on instinct and personal judgement of facts presented*

Development stage description: Gathering knowledge
"…we had to do a research report and I went out to my old secondary school… It was conversation, a questionnaire, having a chat with them. I identified… the hardest issue was moving Everything fell into place. It was game play; all they wanted to do was play. They don't want a 15 min lecture from the coaches, it is just active learning, and there wasn't enough emphasis on active learning … you need a motion"   **Causal/Effectual characteristics:** *Interpreting research findings and proposing direction for development is a dual causal/effectual approach combining agile thinking, direction finding and action-based response (effectual) from a structured process defined in the project plan (causal)*

Development stage description: Generating ideas
"I built three mock-ups… I was just adjusting the centre of gravity and I still didn't know what I was doing… asked them to use it… I remember going, this is not going to work but hopefully it will give me other ideas, see what comes out the other end"   **Effectual characteristics:** *Communicating understanding of effectual process where the action from direct experience is over-riding the need for a detailed plan. Belief in action, based on findings from the research phase, that embodying the 'needs' will drive new ideas and directions*

Development stage description: Understanding concepts
"I got a bit focused and got a Family loan and my personal savings that I put against it. I filed for patent shortly afterwards just with that basic concept I'm going to push on with this and see where it takes me".   **Causal characteristics:** *Following the causal plan of development of the concept but taking an effectual side-step to protect the IP based on 'gut instinct and hunch that the concept is good*   **Effectual characteristics:** *Even at this early stage of investment the decision to take a risk with life savings shows a belief in the concept that is probably based on a calculation of 'affordable loss' over risk or risk aversion*

Development stage description: FYP showcase
'Product A' refined concept with underpinning research and design phase documentation supports successful graduation   **Causal characteristics:** *The end of year Showcase marks the end of the academic phase where a largely causal plan (with effectual action and reaction to encountered stimulus) results in an embodiment of the 'Product A' product proposal*
"Filed patent on concept to protect the product during the Showcase"   **Effectual characteristics:** *Action taken beyond the academic needs of the project demonstrates entrepreneurial action to considered academic outcome – effectual response*

Development stage description: Start spin-out
"Look, this concept works and I have a patent on it but I haven't a clue how to manufacture it I was still playing sports and the sports club were still paying for my accommodation and giving me a small bit of money. I saved everything and put it all toward the patent when it came up in six months' time. We have it patent pending in all the major sports markets even Japan".   **Causal characteristics:** *Causal actions according to predictable outcome, however, it shows a level*

of effectual response to the outcome.

Development stage description: Determining means
"You are the inventor, the business person, the accountant, the fund raiser, the web designer, managing and picking out the trade shows, it is dizzying but it is cool" **Causal characteristics:** *Shows an organised outlook and nascent business structure. The causal and effectual are showing co-dependant importance*
"I got a bit focused and got a Family loan and my personal savings that I put against it. I filed for patent shortly afterwards just with that basic concept *I'm going to push on with this and see where it takes me".* **Effectual characteristics:** *Acknowledging acceptance of unknown as a potential for advancement*

Development stage description: Prediction v control
"I'd identified the incubation program as an opportunity to get on a start-up program. The incubation program was ok, here's the path and you follow ... access the funding. I got two funding vouchers? I got another Voucher from my local enterprise board, I got some early money from another agency, grand and that was all within the incubation program, so if I wasn't there that probably wouldn't have happened" **Causal characteristics:** *Taking advantage of causal structures offered with knowledge of effectual opportunities and advantages resulting from the program* **Effectual characteristics:** *Clear decision to embrace causal structures such as , business plan (implies future planning based on targets, etc.) as a means to securing funding and partnerships*

Development stage description: Risk v affordable loss
"I went down the route with probably one of the biggest manufacturer here in the sport; got on very well with him, very keen to develop this, going to be a 'Name' product, "our guys can do it" and I said look are you sure? Oh we make equipment, which has all that stuff, don't worry. Their guys didn't have the expertise. Then it was a different conversation of a joint venture… Didn't work out" **Causal/Effectual characteristics:** *Managing risk and opting out of a partnership which did not bear fruit as hoped – gauging extent of 'affordable loss'* **Effectual characteristics:** "I got some made up in abroad and in hind-sight was never going to be anywhere near to the final product but what it did do was it showed our logo on a custom made prototype that people thought was a product"

Development stage description: Competition v Partnership
"Finally, a company that manufacture abroad… for a year we were developing it, making different ones. We didn't realise they were in a development process... and I flew over 4 times, brought my mentor for a bit of weight… but three weeks into it, the development of the product broke down, I was trying to sell them the bigger picture, I thought the project was over. It was really challenging for about 2 hours. It was very stressful but good. Six weeks later I was able to fly home with the final product" **Effectual characteristics:** *Developing partnership with potential manufacturer and developing an understanding that is built on reciprocal advantage*

5 RESULTS

The raw data from the pilot semi-structured interview with case-study ('Product A') is divided into the chronological stages of the development process as described by the case-study actor. Each stage shows data from the interview as stated by the actor and interpreted by the researcher for its 'causal' or 'effectual' characteristics. Each stage shows an analysis of the reasoning behind the classification. Many of the statements from the raw-data show 'causal' and/or 'effectual' characteristics. Many reflect both causal and effectual thinking in that they are part of a structured plan to mitigate the risk through planning but also reflect the characteristics of 'control' by reacting to the effects of preceeding happenings. Through the interview it became clear that the patterns were not clearly 'causal' or

'effectual' alone. In particular there was a pattern of developing business plans as a way to win funding. Pragmatism dictated that using business plans to gain funding was important, however, it was clear that the business plan was not always used to control the future. Importantly, the building of partnerships was critical to the development process. Breakthroughs came from critical partnerships where the combined skills and specialisations allowed progress. Embracing chaos and the potential for unforseen positive outcomes was seen to be a character trait of the actors.

6 DISCUSSION AND CONCLUSIONS

Effectual reasoning, however, is an identifiable methodology used in the "fuzzy front-end" (early design phase). The seemingly chaotic nature of problem identification, ideation, concept design and refinement, particularly employ a brand of thinking and process that is effectual. The design phase is a strategy of identified phases that depend on the effectual abilities of the design team to act in a constantly moving and changing environment. Reaction to new inputs and dependence on associated players or partners are the hallmarks of design. This thinking mode is built upon a 'causal' structure that provides a level of structure that is necessary for essential prediction that in this case-study allowed for the acquisition of funding that otherwise would not have been forthcoming.

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