ABSTRACT
The objective of this paper is to examine, analyse and verify possible success activities for Design Management. Based on mapping out the development of the New Product Development process and its design sub-process it is hypothesized that New Product Development success activities which promote product success are also the central activities for a Design Management process that leads to successful products. Resulting from this a list of New Product Development success activities is established. Further, it is hypothesized that the most frequently referenced activities are also the most important. In a subsequent analysis of the DME Award company dataset, the elaborated activities are verified and analysed against the established list of activities promoting success. Results show that companies which are recognized for good Design Management address this set of success activities in their Design Management process. However, the second hypothesis that the most referenced success activities are also the most important is not supported.

INTRODUCTION
This paper forms part of a wider research project examining the impact of Design Management (DM) on companies’ economic performance. This article presents the initial step of such an aim in seeking to identify which DM activities need to be addressed in order to maximise the potential for success when developing a new product. This is undertaken via an empirical investigation on Europe-wide company data which originates from the Design Management Europe (DME) Award. This award has been held since 2005 by a group of design centres, cities and the University of Wales Institute, Cardiff amongst other universities and is bestowed for the best practice in DM. Along with the DME Award a significant volume of data was gathered on each of the entrants via questionnaires. This data relates to the DM organisation in practice and the economic performance of the DME Award entrants. Altogether there are 313 completed questionnaires from the DME Awards 2008-2010 available for further study and interpretation.

The main hypothesis of this article is that New Product Development (NPD) process activities which promote product success are also the central activities for a DM process that leads to successful products. The first objective of this article is to map out the development of the NPD process, including the sub-process of design which later evolved to DM. This will show that both the NPD process and DM actually follow the same pathways. Secondly, derived from the literature a theorized listing of particular NPD activities is established. These activities have been proven to promote successful product development. Further, it is hypothesised that the activities with the most frequent references in the literature are also the most important success activities.
But does the theory match industrial practice and do companies actually follow those pathways in their daily business operations? The DME Award data on companies’ DM performance in practice provides a rare opportunity to analyse this question. In a subsequent analysis of the DME Award company dataset, the elaborated activities will be verified and analysed against the established list of activities promoting success.

Success might be described as a common goal of any business. However, the term “success” is subjective; thus, every company might define and measure success differently. To address such subjectivity Cooper and Kleinschmidt (2007) investigated common success metrics. Throughout this article success is defined by the success metrics presented in Table 1.

Table 1: Performance/Success metrics

<table>
<thead>
<tr>
<th>Performance metrics</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>Success rate</td>
<td>The proportion of development projects that became commercial successes</td>
</tr>
<tr>
<td>Percentage of sales by new products</td>
<td>The percentage of the business unit's sales accounted for by new products</td>
</tr>
<tr>
<td>Profitability relative to spending</td>
<td>How profitable the business unit's total new product efforts were, relative to the amount spent on them</td>
</tr>
<tr>
<td>Technical success rating</td>
<td>How successful the total effort was from a technical/technological perspective</td>
</tr>
<tr>
<td>Sales impact</td>
<td>How strong an impact the total new product effort had on the business unit's top line or sales revenues</td>
</tr>
<tr>
<td>Profit impact</td>
<td>How strong an impact the total new product effort had on the business unit's bottom line or annual profits</td>
</tr>
<tr>
<td>Meeting sales objectives</td>
<td>The extent to which the total new product effort met the business unit's sales objectives for new products</td>
</tr>
<tr>
<td>Meeting profit objectives</td>
<td>The extent to which the total new product effort met the business unit's profit objectives</td>
</tr>
<tr>
<td>Profitability versus competitors</td>
<td>How profitable the total new product effort was relative to competitors</td>
</tr>
<tr>
<td>Overall success</td>
<td>All things considered, how successful the business unit's total new product efforts were when compared to competitors</td>
</tr>
</tbody>
</table>

(Cooper and Kleinschmidt, 2007, p. 55)

It is widely recognized that the success, growth and prosperity of any business is highly dependant on successful NPD and the market introduction of the new products and services (Cooper and Kleinschmidt, 1986, Cooper and Kleinschmidt, 1993b, Huang et al., 2002). Identifying the activities within the NPD process which are accountable for new product success has been a major research field for academics and managers (Rochford and Rudelius, 1997).

However, ever increasing competition, fast paced alterations in technology and product’s economic life time has caused a growing need for businesses to develop and innovate new products more efficiently and effectively (Huang et al., 2002). Therefore, the role of design within the NPD process, e.g. as a key factor of product differentiation, is increasingly recognized. The integration of design into the NPD process emerged into the concept of DM (Buchanan, 2004, Montana et al., 2007). In spite of this, the current research regarding DM is limited and diverse. Nevertheless, current literature suggests that successful DM has a positive impact on design effectiveness. Furthermore, it has been demonstrated that design has a positive contribution to company performance. However, empirical evidence that DM has a positive correlation and impact on companies' economic performance has not been adduced (Best, 2006, Chiva and Alegre, 2009). Addressing this lacuna of knowledge may have a significant impact on basic principles of DM organisation and execution.

METHODOLOGY

This article draws on two approaches.

- Establishing a common success activity list of the NPD process from literature
- Empirical validation of the established success activities
The literature review considers a wide range of NPD success activity research, although particular attention is given to the research conducted by Cooper and Kleinschmidt throughout the years (Cooper and Kleinschmidt, 1986, Cooper and Brentani, 1991, Cooper and Kleinschmidt, 1991, Cooper and Kleinschmidt, 1993a, Cooper and Kleinschmidt, 1993b, Cooper, 1994, Cooper and Kleinschmidt, 1995, Cooper, 2000, Cooper et al., 2002, Cooper and Kleinschmidt, 2007, Cooper and Edgett, 2008, Cooper, 2009). Resulting from this analysis a common success activity list has been established according to the most often cited activities appearing in the examined literature. The literature review maps out the development of NPD success activities research over time. It shows that eventually the importance of design in the NPD process underwent a significant shift from being a sub-process to becoming the driver of the NPD process, evolving into the concept of DM. By means of this evolvement it is argued that NPD success activities are equally important for DM and that the previously examined NPD process success activities can logically be considered the most important activities for successful DM.

Secondly, the hypotheses, derived from a theoretical analysis, are validated by an empirical test of company data captured via the DME Award.

**DEVELOPMENT OF THE NPD AND DESIGN PROCESS**

NPD is defined as the development process of designing novel goods and services. This involves a set of activities which should follow a methodology in order to get from the initial product idea to a market launch of the product. Ideally, these methods should incorporate solutions that are most applicable to the business (Brentani, 2000, Otto and Wood, 2001).

Examining published research on the NPD process has revealed a distinct development of the NPD process over time. It became apparent that the considered importance of certain sets of activities within the NPD process has drastically changed over the past 25 years. At the same time the importance and recognition of design as one activity of the NPD process also changed radically. Eventually, NPD research resulted in the evolvement of a new concept, known as Design Management. This bidirectional development is outlined in Figure 1 and will be further mapped out in the following section.

*Figure 1: Development of the NPD process and Design to the concept of Design Management*
The NPD process
During the period from the late 1980s to the early 1990s, different specific NPD process activities were identified and tested to discriminate which activities in particular were deemed critical for success. In the earliest considered study, Cooper and Kleinschmidt (1986) identified 9 activities as having a significant influence on a successful project outcome. All of these activities were related only to the pure set of executive activities. Executive activities refer to the set of physical activities a new product has to undergo during its development process, e.g. market research. Supporting executive activities are managerial activities which encompass activities related to the structure of managing a project. This first study hinted that how well each of these activities is managed is critical to product success (Cooper and Kleinschmidt, 1986).

In 1990 Zirger and Maidique analysed 86 electronic product pairs in a comparative study for success factors. The most outstanding result of the comparison was the critical need for managerial excellence. Particular importance was attributed to crossfunctional groups with an appropriate leader and the existence of a strategy aligned to the firm’s existing competences and resources (Zirger and Maidique, 1990). Overall, these study results abetted a paradigm shift considering only four years prior the emphasis was placed on executive activities.

Cooper’s study (1994) expanded the notion of the ideal activity set. The identified activities, in contrast to Zirger and Maidique’s study (1990), incorporate and combine both executive and managerial type activities as important for success. In relation to this, it is seen as essential that the organization of the management is well structured and the executive activities are carried out to a high quality standard (Cooper, 1994). The shift from executive importance, to managerial importance and then to a combination of the both makes it apparent that these two categories should work synergistically with the important underscore of quality management overall.

A different approach to the use of management was the concept of the Stage Gate Model. The Stage Gate Process model represents a filtering funnel that ensures only the best ideas and products go through onto the next step to prevent wasting or spreading out resources (Cooper et al., 2002, Cooper, 2009). This approach is critical to highlight because represented an innovative step to taking the focus away from the executive activities and placing more gravity on managerial tasks, in this case, screening. Managing the idea and process and aligning this to the business resources is the key factor.

In 2003, a study by the Product Development & Management Association (PDMA) on best practice projects was conducted. This study was used by Barczak et al. (2009)- whose findings emphasized especially the importance of managerial issues, e.g. strategy, multi-functional teams and top management support.
Similar to this, Brentani and Kleinschmidt (2004) compared 320 companies and found that to achieve outstanding results, the best performers incorporated senior management and utilized appropriate resources that were committed to the NPD process. Most importantly, these companies had a corporate culture that supported their NPD process, where company values were instilled with the importance of the NPD process.

Design Process/ Management
The NPD process has a complementary process known as the design process which describes the creation of solutions for all conducted creative activities (Moultrie et al., 2006).
As with the NPD process, the design process also went through significant changes. In the 1990s, design was considered as one of the activities within NPD. It was only integrated at the stages of the NPD that were associated with design. In the early 2000s, design underwent a shift to becoming the leader of the NPD process. It was recognized that giving designers a more fundamental role can enhance the entire product development process, creating a more synergistic versus individualistic environment. With it the role of design in the NPD process changed, as it not only leads product development, but is also a critical sub-process in itself. (Perks et al., 2005).

The importance of design as a process utilized in product development was studied and shown by Hertenstein et al. (2005). It was discovered that the use of design is strongly associated to better financial performance in various ways, e.g. higher return on sales (Hertenstein et al., 2005).

These findings clearly demonstrate that design is a very powerful sub-process in product development and leads to the conclusion that its positive effects are magnified once integrated into the entire methodology. However, once a part of the process, it will also be necessary to implement management skills such as motivation and persuasion, relationship management and negotiation and the ability to effectively market a product (Perks et al., 2005). Exactly as in the NPD process, this once again highlights the importance of management at any level.

This importance of management in the design process developed a concept known as “Design Management”. DM are steps that involve creation and the augmentation of managerial and strategic decisions. As defined by Peter Gorb:

“Design Management is the effective deployment by line managers of the design resources available to a company in order to help the company achieve its objectives” (Gorb in Mozota, 2003, p. 70)

This discipline oversees and directs a company’s creativity and manages the company itself in accordance to their design principles. Through the discovery and conveyance of the mode in which design can add to the value of business strategy, it fulfils the need to manage staff and other financial resources (Mozota, 2003). Most importantly, the coordination with other managerial functions highly influences the effectiveness of the DM process. Through the assimilation of DM with NPD, product development and the generation of positive customer interaction are simplified. Therefore, it is integral that DM is a component of a company’s working strategy (Montana et al., 2007).

Both, the NPD process and design underwent significant shifts in the past 25 years. Initially, the major importance in NPD was placed on executive activities with design being one executive activity as part of a wider process. Over time this recognized importance changed, first to emphasizing the importance of managerial and executive activities and eventually to accepting the managerial activities as the most important activities within the NPD process. Simultaneously, design underwent a shift from being a sub-process within the NPD process to becoming its leader. In combination and due to the recognition of the importance of having to manage the NPD process with design as its leader, a new concept arose, Design Management. DM arose out of the shift in importance of the NPD process activity types and the simultaneous shift of design. Inferential, DM is the “how to” facet; it is the “management portion” of the NPD process that functions under the consideration of design principles.

Therefore, it is supposed that all success factors of the NPD process are success factors of DM.
NPD SUCCESS ACTIVITIES

As part of the literature review, 26 studies on NPD success activities were considered and the referenced success activities excerpted. Table 2 lists the most frequently referenced success factors listed in descending order of most referenced and separated into managerial and executive activities.

<table>
<thead>
<tr>
<th>Management activities</th>
<th>Executive activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy</td>
<td>Customer involvement/ focus</td>
</tr>
<tr>
<td>Cross functional teams and good communication</td>
<td>Market research and understanding of market needs</td>
</tr>
<tr>
<td>Product/ Process Champion</td>
<td>Financial and business analysis</td>
</tr>
<tr>
<td>Top management support and involvement</td>
<td>Preliminary market assessment</td>
</tr>
<tr>
<td></td>
<td>Preliminary technical assessment</td>
</tr>
</tbody>
</table>

As stated above, it is hypothesised that these NPD process activities which promote product success also the central activities for DM. This hypothesis will be tested and validated in the subsequent analysis of the company datasets.

THE DATA

The data for the subsequent analysis is derived from the DME Award entrant questionnaires from 2008, 2009 and 2010. This data relates to the DM organisation in practice and the economic performance of the DME Award entrants. The DME Award received 163 questionnaires in 2008, 73 in 2009 and 77 in 2010. Though the questionnaire sets of 2008 and 2009/2010 do not feature identical questions, the questionnaire structure and general baselines remain the same and all questions offer multiple choice answer possibilities. In general, both questionnaires give data that can be broken down into four subcategories. These subcategories are:

1. Company data, e.g. company size, employee count etc.
2. Financial data, e.g. turnover, investments, etc.
3. Design approach, e.g. selection for design, use of design etc.
4. Self-assessment, e.g. affects of DM on performance, customer satisfaction etc.

An analysis will be conducted based on the data from these 313 questionnaires to test if companies with good DM make use of the suggested success activities for the NPD process. If the companies with good DM undertake those activities then the hypothesis can be supported, implying that the same success activities for the NPD process equally apply for DM. In order to test the second hypothesis, the quantitative data analysis will test if the activities with the most references derived from the literature review are also the most frequently used.

In order to quantify good DM in practice, data from the winners of the DME Award were chosen for analysis. These companies were chosen by a jury consisting of internationally recognized DM experts. These experts chose the winners of the DME Award based on the company’s DM performance according to opinions formed around their expertise.

Altogether there are 19 DME Award winners from 2008, from which one questionnaire will be deducted due to insufficient data, 6 DME Award winner questionnaires from 2009 and 4 DME Award winner from 2010. The questionnaires from 2008 and 2009 are not identical, thus an all-encompassing analysis is not feasible.

Each of the previously excerpted nine success activities are covered by at least one corresponding question from the DME Award questionnaire 2008-2010.
As a further method of validation and justification for considering the DME Award winners as the main source to investigate the formulated hypotheses, the results of the winners will be compared against the entire dataset. Consequently, the winning companies are expected to reveal more effective utilisation of the nine activities than the entire cohort.

RESULTS
The different examined activities on the basis of the dedicated questions from the DME Award questionnaire reveal different percentages of “effective utilisation” based on the extent to which the companies make use of the nine suggested success activities. The percentage score is dependent on each company’s frequency and extent of utilisation of each activity with the better use of each activity receiving a higher percentage score.

Figure 2 displays the final score of effective utilisation of the nine success activities. This final score for all three years is well above 50% for all companies. The lowest score tallied at 53% was in 2008, while the highest score of 62% was in 2009. Despite the slight decrease in 2010 the general linear trend remains positive. Further, it is demonstrated that the overall score of the winners throughout the three years is better than the score of all companies. In 2008 the score is 7 percentage points higher than for all companies, steadily increasing to 77% in 2009 and 81% in 2010. The same pattern reoccurs throughout the whole analysis. For each of the nine activities and for all three years it is noticeable that the DME Award winners always make better use of the activities in comparison to the entire dataset. Additionally, it is observed that for most of the activities the score in 2009 is the highest while a slight decrease in 2010 occurs. However, the general trend remains positive.

Furthermore, in 2010 all companies and the DME Award winners score at least 50% in each of the nine activities. This confirms the above stated positive trend since the previous years still showed outlying values. Although, the first activity "customer test/involvement/focus is the most referenced success activity in the considered literature the results from the data analysis does not support the suggested importance of this
activity. In fact, all companies as well as the DME Award winners scored better overall in the least referenced activity of “preliminary technical assessment”.

CONCLUSION
Every business strives to be successful in terms of performance. The driving force for outperforming competitors is new products. Simply put, new products equal growth and NPD is the primary source for success. However, the process for developing new products is a risky and unpredictable endeavour. This hazardous side-effect led to research concentrated on methods in which to make the NPD process as efficient and predictable as possible. Thus, in the last 30 years, studies were performed trying to discover the key success factors that a business needs to employ during NPD.

This paper demonstrates that the research on NPD success factors underwent a cultural shift. In the early years of NPD process research, focus was maintained on efficiently performing executive type activities. Gradually the attention was moved toward the importance of managerial type of activities. Eventually, it was realized that a combination of both is necessary in order for a firm to perform well against its industry competitors. The most contemporary findings now emphasize the critical value of not just the tasks themselves, but the utilization of “soft skills” when conducting these tasks. Soft skills basically refer to “management skills”. The investigations of studies for success factors confirm the importance of managerial tasks in the NPD process. Additionally, it emphasizes the outstanding importance of conducting pre-development activities. These results follow logically because the pre-development activity largely determines the development of the product concept. Management activities are: Strategy, Cross-functional Teams and Good Communication, a Product/Process Champion and Top Management Support and Involvement. Pre-development activities are: Customer Involvement/Focus, Market Research and Understanding of Market Needs, Financial and Business Analysis, Preliminary Market Assessment and Preliminary Technical Assessment.

The focus change from executive to managerial task importance was indeed an important development in business strategy. Nonetheless, the essence of modern day NPD lies in the way that DM became the leader and its own discipline within the NPD process. DM is managing the NPD process with design principles upheld.

The remaining question was if the excerpted success factors of the NPD process are also applicable when DM is being used. As argued, DM confines itself to the managing activity of the NPD process. The only difference to managing a conventional NPD process lies with the consideration of design principles when using DM, and making design the leader of the NPD process. Since all activities, managerial and executive, remain the same and just the focus of attention changes, it can be concluded that all success factors for the NPD process are also success factors when DM is being used.

This is supported by the results of the effective utilisation of the nine suggested success activities. On average is the final score for all three years well above 50% with a positive general trend. The DME Award winners even make greater use of the nine success activities with an even more positive general trend. All companies score over 50% and the DME Award winners even up 81% in 2010 and a general positive trend towards an improvement for future perspectives is observed. Consequentially, the hypothesis that the most frequently referenced NDP process success activities also apply for DM is supported. However, the ranking of those activities will need to
undergo further adjustments since the second hypothesis that the most referenced success activities are also the most important is not supported. Further, it raises the question: do any additional success activities exist and how influential might they be to the project outcome.

Therefore, a detailed follow up study with some of the investigated companies will be necessary to further refine these findings. Now that predictors have been identified it is possible to conduct empirical research and gather numerical data to support these findings. In addition, it paves the way to more micro-research into the area of DM.

REFERENCES


