

Individual ambidexterity in practice: The experience of product designers in the earthmoving machinery industry

Halvar Rautenbach

Student number: 23183935

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ABSTRACT

South Africa's manufacturing performance relative to its' peers and other local sectors has been in decline in the wake of globalisation and global value chains and reduced competitive advantage. Firms are central actors in the competitive advantage of competing value chains. In order to achieve and sustain competitive advantage firms, and especially manufacturing firms, have to continuously explore new market possibilities while at the same time leveraging existing competencies in an exploitative fashion. When firms pursue explore and exploit in combination the firms can be described as being ambidextrous organisations. When it is left up to individual employees of these firms to contribute to ambidexterity by deciding when to explore and when to exploit, and they are able to do this in combination, the individuals achieve what is termed individual ambidexterity. Although it is known that individual ambidexterity contributes to organisational ambidexterity, very little is known about the manner in which individuals achieve individual ambidexterity and what the outcomes of individual ambidexterity are.

The current research project sought to gain a deep understanding of individual product designers' lived experience of achieving ambidextrous outcomes in the normal course of their work in the earthmoving machinery manufacturing sector. A qualitative, exploratory research design was adopted and thirteen semi-structured interviews conducted with individual product designers. The interviews were analysed through thematic analysis to yield rich findings as reported here-in.

Key findings reported relate to the key role managers and the individual's own knowledge play in achieving individual ambidexterity, while the reported negative outcomes of individual ambidexterity are a key contribution to individual ambidexterity literature. As part of the analysis process a model was devised that allows for the identification of potential virtuous and vicious cycles of individual ambidexterity. Implications for stakeholders and the contribution to literature are also addressed

KEY WORDS

Individual ambidexterity, product design, paradox, job satisfaction

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Halvar Rautenbach

Date:

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CHAPTER 1: RESEARCH PROBLEM DEFINITION AND PURPOSE STATEMENT

1.1. Manufacturing Performance

The establishment of global value chains and globalisation has broken down conventional barriers of competition in the manufacturing industry. South African manufacturing value added as a contribution to GDP (MVA%) has declined from 14.5% in 2008 to levels below 12% at the end of 2018, reflecting a relative decline in manufacturing compared to other economic sectors in South Africa (Trading Economics, n.d.). This decline comes in the wake of manufacturing still being sighted as critical to the economic growth of developing economies (Haraguchi, Cheng, & Smeets, 2017). In contrast China is aiming to increase its MVA% to 25% by 2025 (Deloitte, 2016).

Deloitte periodically conducts a survey among Chief Executive Officers to establish a global manufacturing competitiveness index. Over a number of surveys many nations were able to improve their manufacturing competitiveness relative to other nations. In contrast South Africa was ranked in the 27th position worldwide in the latest survey, published in 2016, down 3 places from their previous ranking in 2012. This placed SA ahead of BRICS peers Brazil (29th) and Russia (32nd), however considerably lagging India (11th) and China (1st) (Deloitte, 2016).

Although the survey ranks manufacturing competitiveness at a macro level, the factors identified as most influential in manufacturing competitiveness are internal to the firm, with talent, cost competitiveness, productivity, and the supplier network being cited as the most important determinants of competitiveness (Deloitte, 2016). At an industry level the sources of competitive advantage in manufacturing firms have been found to differ from other industries (Rumelt, 1991). In contrast with other industries, where industry effects determine a large proportion of relative firm performance, Rumelt (1991) concluded that heterogenous internal factors explained most of the variability in manufacturing firm performance. By implication manufacturing firms have an opportunity to develop such internal heterogenous sources of competitive advantage, and in the process improve firm competitiveness and performance.

In recent times the old economic powerhouses like USA, Great Britain and Germany managed to consolidate and improve their standing in the manufacturing competitiveness of nations survey, displacing notions that competitiveness relies on low-cost labour. Looking ahead Deloitte (2016) propose that companies retain their focus on talent, predicting fierce competition between nations and firms for talent. Among other emerging trends, adopting advanced technologies, leveraging ecosystem partnerships, and finding the right global balance are cited as key elements of future competitiveness.

While firms come to grips with these future trends in a bid for long term sustainability, it is essential that current positions be maintained to ensure short term survival, in the process balancing the best use of the resources available (March, 1991). Ambidexterity is an operationalisation of the pursuit of short-term survival and long-term adaptability in combination.

1.2. Ambidexterity

1.2.1. Background

In his Resource Based View of the firm (RBV) Barney (1991) introduced the notion that the knowledge a firm controls, together with other resources like organisational processes and routines, and management skills, contribute to a sustained competitive advantage. Teece, Pisano, and Shuen (1997) argued that access to resources is not sufficient to ensure a sustained competitive advantage, and that the firm's ability to integrate and configure these resources in response to changes in the operating environment is the actual source of sustainable competitive advantage, calling for firms to sense the changes while seizing opportunities. This process of reconfiguring resources was aptly named Dynamic Capabilities of the firm. Bernstein & Barrett, (2011) concluded that "Dynamic capabilities are not just a one-time response to an environmental jolt but represent persistent and structured efforts dedicated to improved performance" (p. 58).

James March (1991) investigated competitive advantage from an organisational learning perspective and considered the relation between exploring new possibilities and exploiting old certainties. Exploration was described as including "things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation" while exploitation "includes such things as

refinement, choice, production, efficiency, selection, implementation, execution” (p. 1). March (1991) further continued that striking the correct balance in allocating scarce resources between exploring and exploiting is a primary factor in determining a system’s (or firm’s) survival and prosperity.

1.2.2. Organisational Ambidexterity

In 1996 Tushman and O Reilly (1996) introduced a concept called the ambidextrous organisation into the corporate strategy body of literature. An ambidextrous organisation was described as one that is able to evolve through periods of incremental, evolutionary change as well as discontinuous or revolutionary change. It was proposed that firms secure value from current capabilities and markets through a process of incremental improvement, while at the same time exploring the disruptive type of opportunities that would unlock step wise improvements in the future. In later literature this ambidexterity was aptly summarised as calls to explore and exploit (O’Reilly & Tushman, 2013).

Firm specific Dynamic Capabilities, including the ability to act ambidextrously, are part of these influential heterogenous factors which differentiate the drivers of performance in manufacturing firms compared to other industries. This has incited research motivation into organisational ambidexterity and beyond. In organisational ambidexterity research Geerts, Blindenbach-Driessen and Gemmel (2010) found that manufacturing firms are more likely than service firms to pursue ambidexterity. In their survey of Spanish manufacturing firms Tamayo-Torres, Roehrich and Lewis (2017) found that increased ambidexterity positively correlated to firm performance, and that the relationship was more significant in firms exposed to dynamic environments. This underscores the relevance of ambidexterity research in manufacturing contexts.

1.3. State of ambidexterity literature

The research on organisational ambidexterity is varied in its conceptualisation of how ambidexterity is achieved. The first point of delineation that is encountered is whether firms approach explore and exploit as separate activities, and spatially separate the two activities in how the firm is designed, i.e. **structural ambidexterity** (O’Reilly & Tushman, 2004), or if the firm approaches explore and exploit activities without structural separation, executing explore and exploit within single teams or business

units, separating the activities in time, i.e. **temporal ambidexterity** (Simsek, Heavey, Veiga, & Souder, 2009). The third type of organisational ambidexterity that is reported on is **contextual ambidexterity**, and in this school it is posited that ambidexterity can be invoked at any level in the organisation based on environmental and internal factors (Gibson & Birkinshaw, 2004). This view of ambidexterity as a multi-level phenomenon has contributed to academics shifting focus from the organisational level to also cover lower-level units of analysis and their influence on ambidexterity.

In a recent analysis of the state of ambidexterity research Saurav, Kumar, Kumar and Swarup (2018) report that the predominant focus of ambidexterity research, in the past two decades, was on the firm and business unit or sub-unit unit of analysis. From 504 papers related to ambidexterity that were analysed 427 papers were found to focus on the unit of analysis of the firm, business unit or sub-unit. A number of studies, however, found that ambidexterity was not only a firm-level phenomenon but that it exists at multiple levels in the firm (Gibson & Birkinshaw, 2004; Mom, Chang, Cholakova, & Jansen, 2018), and that individual level factors beyond top management (Gibson & Birkinshaw, 2004; Mom et al., 2018; Mom, Van Den Bosch, & Volberda, 2007), influence the successful achievement of ambidexterity as well, initiating calls for research at the team and individual units of analysis.

1.4. Individual ambidexterity

The calls for research at the individual level of analysis did not go by unanswered. In a recent systematic review of individual ambidexterity literature, it was reported that from 1999 until the time of publishing the review in 2020 71 articles which focused on individual ambidexterity were published in 47 different journals. From 2009 there has been a marked increase in the number of articles published. The fact that the articles were published in 47 different journals, with research focuses ranging from corporate strategy to sales and marketing, operations management, human resource management and beyond indicates that the knowledge on individual ambidexterity is very dispersed.

Individual ambidexterity is defined as “the behavioural orientation of employees towards combining exploitation and exploration related activities within a certain period of time” (Caniëls, Neghina, & Schaetsaert, 2017, p. 1099). Nonaka (2007)

explains that new knowledge begins in an individual, and that organizational knowledge is developed through the sharing of individual knowledge. Caniëls, Neghina and Schaetsaert (2017), reporting on ambidexterity research conducted at the individual unit of analysis, continue that knowledge, knowledge sharing, and the novel application of it, is key to innovation through knowledge application. This is true for the incremental innovation as described by exploitative actions, as well as the revolutionary innovation associated with exploratory actions. Swart, Turner, van Rossenberg and Kinnie (2019) explain that exploitation requires specialist knowledge while exploration requires general knowledge, and that employees across organizational levels contribute individually to ambidexterity.

As reported in Chapter 2 individual ambidexterity has been found to be influenced by various factors. Individual factors such as motivation orientations, role identity, individual competencies and actions, as well as organisational culture and HRM practices are identified as influencing the achieved levels of individual ambidexterity. It is furthermore evident that employees at different levels in the organisation are enabled to act ambidextrously in different ways. It is furthermore reported that it is possible to achieve higher levels of organisational ambidexterity by raising individual ambidexterity levels, confirming the necessity of a better understanding of individual ambidexterity.

In another systematic review of individual ambidexterity literature Mu, van Riel, and Schouteten, (2020), reported that, as at the organisational level, individuals achieve ambidexterity through different approaches and mechanisms. It is furthermore reported that the antecedents and outcomes of ambidexterity at the individual level was dependent on the adopted approaches and mechanisms, and that these are subject to ambiguity in the current literature.

There are conflicting reports in literature with regards to the extent to which explore and exploit can be combined in a complementary fashion (Miron-Spektor, Ingram, Keller, Smith, & Lewis, 2018), with the alternative view being that they have to be balanced since explore and exploit are different modes competing for the same resources (Greco, Charlier, & Brown, 2019). In the first dimension, termed the 'Balance dimension' it is proposed that the individuals view of the compatibility of

explore and exploit activities will influence the antecedents and outcomes of individual ambidexterity (Mu et al., 2020).

The second point of delineation found in the literature relates to the manner in which explore and exploit activities are engaged in a certain time is also posited to influence these (Mu et al., 2020; Pertusa-Ortega, Molina-Azorín, Tarí, Pereira-Moliner, & López-Gamero, 2020). In an individual ambidexterity operationalisation that aligns with the temporal ambidexterity found at the organisational level it is proposed that individuals cycle between explore and exploit in a temporal fashion (Andriopoulos & Lewis, 2009, 2010; Caniëls & Veld, 2019; Greco et al., 2019; Schnellbacher, Heidenreich, & Wald, 2019). The alternative to temporal cycling is to engage explore and exploit outcomes in a simultaneous fashion without differentiating between the two modes (Miron-Spektor et al., 2018; Papachroni & Heracleous, 2020; Papachroni, Heracleous, & Paroutis, 2015).

When the Balance and Temporal dimensions are combined it is possible to categorise the individual's operationalisation of individual ambidexterity according to these dimensions. (Mu et al., 2020).

1.5. Product design and manufacturing

Beyond adoption of ambidextrous approaches, the activities firms undertake also influence relative firm performance. A recent study, that included more than 2 million European firms, established that the relative position of a firm's activity in relation to the end user influences the share of value the firm captures as a participant in the value chain. The value capture forms a U shape with pre- and post-production processes securing more value than the production and assembly firms in the middle, this is also known as the smiling curve of manufacturing. Research and design are examples of knowledge intensive pre-production process, while distribution and sales are examples of post-production processes (Rungi & Del Prete, 2018).

Ambidextrous demands pervade product design settings due to the nature of product design. A combination of explore and exploit at various levels is necessary to accomplish design outcomes, which are informed from the requirements designs have to satisfy, to the design process of bringing products into being (C. L. Wang & Rafiq, 2014).

1.6. Contribution to business

From the preceding it is concluded that a better understanding of ambidexterity and the enabling and inhibiting factors of ambidexterity in manufacturing firms is of value to business as it will inform business decisions that relate to the current and future competitive position of the firm. This knowledge will contribute to a better understanding of the antecedents manufacturing firm performance and ultimately prosperity. Further to this a focus on product design in manufacturing firms is of value since product design falls in the higher value pre-production processes described in the smile curve of value added, presenting larger potential gains in performance.

1.7. Calls for future research

Numerous calls have been made for research that provide a deeper understanding of individual ambidexterity. Rosing and Zacher (2017) proposed that research be conducted to establish if individuals view explore and exploit activities as incompatible or complementary behaviours. Mom et al. (2018) called for studies that identify cognitive and motivational factors that have a mediating impact on individual ambidexterity. Pertusa-Ortega et al. (2020) called for research into the outcomes of individual ambidexterity at an individual and organisational level. Mu et al. (2020) proposed that, in future research into individual ambidexterity, the specific type of individual ambidexterity be identified and findings be related to specific operationalisation of individual ambidexterity. A call for future empirical studies that consider specific contextual factors in the investigation of antecedents and outcomes of each type of individual ambidexterity, and to establish if specific types of individual ambidexterity is more suited to certain contexts was also made. Furthermore, it was proposed that it be established how factors influence individual differences in perception of individual ambidexterity (Mu et al., 2020).

The research problem this qualitative research project intended to address was the lacking knowledge of how individuals achieve ambidexterity in specific contexts, and what the positive and negative outcomes and inhibiting and enabling factors of individual ambidexterity in a specific context are.

1.8. Purpose statement

This present research project sought to address the lack of empirical research that focuses on the operationalisation of individual ambidexterity in specific contexts. It was furthermore intended to explore the potential explanatory power of categorising the operationalisation of individual ambidexterity according to the balanced and temporal dimension as proposed by Mu et al. (2020). Further to this, it was intended to identify linkages between antecedents and outcomes that can be leveraged to achieve higher levels of individual ambidexterity.

The purpose of this research was therefore to gain a deep understanding of product designers' lived experience of achieving ambidextrous outcomes in the normal course of their work. The specific focus in this regard was to learn about the designer's operationalisation of individual ambidexterity according to the balanced and temporal dimension, to identify factors the individuals deem to be enabling and inhibiting their individual ambidexterity and what the positive and negative outcomes are of achieving individual ambidexterity. In alignment with calls for empirical research that focuses on specific contextual setting the scope of this research is limited to product designers working in the earthmoving manufacturing industry as a specific contextual setting.

1.9. Contribution to literature and business

The purpose of the research is aligned with a contribution to literature of empirical research on the operationalisation of individual ambidexterity in a specific context. The project also contributes to the lacking knowledge of the negative outcomes of individual ambidexterity as identified by Mu et al. (2020) and Pertusa-Ortega et al. (2020).

From a business management perspective, the research contributes to a firmer grasp on individual ambidexterity and allow firms to better understand how to utilise scarce resources more effectively in pursuit of ambidextrous goals. This is enabled by the identification of how product designers view and achieve individual ambidexterity, isolating internal and external factors identified as influencing the outcomes of individual ambidexterity, and the outcomes itself. A diagram is also provided that enable managers to identify virtuous and vicious cycles of individual ambidexterity. This empowers managers to harness the positive outcomes and

address negative outcomes of individual ambidexterity in pursuit of higher levels of ambidexterity in the crusade to deliver on exploration and exploitation endeavours.

In the next section relevant literature is reviewed which guided the formulation of research questions that sought to address the purpose of this research project.

CHAPTER 2: LITERATURE REVIEW

In this Chapter a review of the literature that informed the research problem and research questions is presented. The chapter is structured to give a holistic overview of ambidexterity literature, a reflection on ambidexterity in product design and the progression of the research agenda from the firm level unit of analysis to the individual level. This is followed by a discussion of relevant individual ambidexterity literature and other aspects that relate to individual ambidexterity in the research context.

2.1. Ambidexterity

The Organisational Ambidexterity literature can be categorised according to the operationalisation of the endeavour to explore and exploit. Literature differentiates between these based on the extent to which explore and exploit are handled as separate endeavours, or alternatively occurring simultaneously (O'Reilly & Tushman, 2013; Turner, Swart, & Maylor, 2013).

The initial approach to ambidexterity found in the literature focussed on firms that followed a structural approach to ambidexterity by assigning the responsibility to explore and exploit to different business units, sub-units or teams. An example of this would be if a firm has an R&D unit focussing on exploring new, radical innovation, which operates separately from its operational units, and these operational units are responsible for incremental exploitation improvements in current products and processes (Tushman & O'Reilly, 1996). This approach, in which exploration and exploitation is spatially separated, was aptly named **structural ambidexterity** (O'Reilly & Tushman, 2004), with a conclusion that since the conflicting agendas of these separate units meet at the management level, ambidexterity was borne out of the choices, capabilities and actions of managers and leaders, with the tension of the explore and exploit dilemma ending in these individuals (Raisch & Birkinshaw, 2008).

Zimmermann, Raisch, and Cardinal (2018) set out to establish how organisational design and configurational aspects interplay in the strive towards achieving ambidexterity. It was reported that senior managers set the organisation up for ambidexterity through a suitable design, and frontline managers enable

ambidexterity through configurational choices. They concluded that the frontline managers should have the autonomy that is required to adapt their approach to ambidexterity, in the process relieving the tension created by ambidextrous demands. When the tension is not relieved at management level individual employees hold the remaining tension and have to decide whether and when to explore or exploit for themselves (Caniëls et al., 2017; Gibson & Birkinshaw, 2004; Zimmermann et al., 2018).

The capacity to devote resources to focus solely on explore or exploit is out of reach for most firms, yet March's call to achieve ambidexterity to support short and long term survival, is not limited to firms who are able to commit to separate structures (Cao, Gedajlovic, & Zhang, 2009; Mu et al., 2020). An alternative approach to achieve ambidexterity is to deliberately separate the explore and exploit activities in time, with the organisation, business unit, or team, switching their collective focus between the explore and exploit modes in an alternating fashion, achieving **temporal ambidexterity** (Simsek et al., 2009).

The view that it is beneficial, or even possible, to isolate the explore and exploit agendas structurally and yet maintain organisational cohesiveness and efficiency is challenged by a number of authors (Andriopoulos & Lewis, 2009; Gibson & Birkinshaw, 2004; Simsek et al., 2009). In a third approach to organisational ambidexterity Gibson and Birkinshaw (2004) identified that ambidexterity can be invoked in any level of the organisation based on environmental and individual factors, positing that "when **contextual ambidexterity** has been achieved, every individual in a unit can deliver value to existing customers in his or her own functional area, but at the same time every individual is on the lookout for changes in the task environment, and acts accordingly" (p. 211) positing that in achieving ambidexterity it is up to the individual to decide when to explore and when to exploit, which has become known as individual ambidexterity. For this current study product design is also of relevance.

2.2. Product design and ambidexterity

In their conceptualisation of product design as an area of research Luchs and Swan (2011) position the product design process in between inputs received from the business and market context, and firm strategy, and consequences for product and

firm performance, as well as the consumer response to the product. This positions product design as a process that interacts broadly in the business environment with a variety of short- and long-term factors determining its directives and necessitating a combination of explore and exploit.

The product design cycle comprises different stages which starts with exploration activities and ends with exploitation activities. Once baseline requirements for the product is established a process unfolds that can be described in 4 steps: Idea generation and screening, in which as many possible ideas that could address the design problem are explored, this is followed by concept development and evaluation of concepts' feasibility, which in turn makes way for technical implementation, and finally the manufacturing and commercialisation phase enables the firm to exploit market opportunities (Luchs, Swan, & Creusen, 2016). Ulrich and Eppinger (2003) also described product design as a multi stage process that aligns with the 4 steps described by Luchs, Swan and Creusen (2016), and confirms that product design is a combination of exploratory and exploitative activities. It is also reported that at a product level the development of new products differs in nature from the development of incrementally improved products and require different processes and capabilities (Luchs et al., 2016).

It can be concluded that product design has explore and exploit tensions that occur at multiple levels and that it is likely that research in this context will yield rich insight into the operationalisation of ambidexterity. Published research on ambidexterity in this context is however sparse. A highly relevant contribution by Andriopoulos and Lewis (2009, 2010) which was published in high impact journals does inform the context to a large degree and is included below.

2.3. Product design ambidexterity

In their research on the organisational ambidexterity, and how innovation is approached in seven market leading product design firms, Andriopoulos and Lewis (2010) reported on the role paradox plays in relieving the tension brought about by the pursuit of ambidexterity. The research population interviewed spanned from the top management teams down to individual designers and engineers employed in product design firms. The firms' primary function was product design which was performed in a consultative fashion.

Rather than viewing explore and exploit tension as conflicting, mutually exclusive endeavours nested in tension, it was reported that these lead design firms tolerate the tug-of-war effect by approaching it as a paradox, “contradictory yet co-existing, interdependent and valuable elements of innovation” (Andriopoulos & Lewis, 2010, p. 106), managed through what is described as paradoxical management approaches in which integration and splitting techniques are combined. Four paradox themes were identified: ‘long term adaptability – short-term survival paradox’; ‘possibilities - constraints paradox’; ‘diversity - cohesiveness paradox’; and the passion - discipline paradox. Each of the paradoxes were found to have capacity to both fuel innovation, or frustrate it if not managed within tolerable bounds.

The ‘long-term adaptability – short-term survival paradox’ describes a view, aligned with the most basic description of ambidexterity. Companies have to jointly pursue adaptability that is necessary to meet the changing demands that stem from new customers, new markets and new products in the long term, while continuing to, in the short term, apply, improve and extend current techniques and capabilities to best match the available production capacity to the needs of existing customers and markets by maintaining existing products (March, 1991). A company that focuses predominantly on achieving breakthroughs may strain resources and ultimately not be able to respond to opportunistic short-term opportunities, known as the novelty trap. On the contrary companies that focus on continually honing specialised capabilities and ignore minor market shifts in consumer demands and technology may miss opportunities to adapt or even revolutionise products or offerings, markets or industries, which is described as a success trap. It was reported that this paradox can be addressed by integrating the role players through a paradoxical organisational vision that confirms the importance of both short-term survival and long-term adaptability, while at the same time splitting focus through a balanced portfolio of projects that aim to achieve radical innovation while at the same time working on projects that have incremental innovation as their aim (Andriopoulos & Lewis, 2010).

The ‘possibilities – constraints paradox’ was reported to manifest itself at the project level, where projects are driven by competing demands promoted by design teams and customers. On the one hand the designers were found to favour ideas that

promoted radically different possibilities for new products or markets, adopting new technologies or techniques, while customers preferred to stay closely aligned with existing capabilities and know-how. This paradox fuels innovation by challenging existing norms and assumptions by exploring new alternatives, while at the same time clearly defining a project's boundaries and providing a platform to gain insights to customer's extensive knowledge and experience of existing products and markets. The constraints also challenge designers beyond their comfort zone where they could be complacent and rely only on favoured techniques. It is proposed that this paradox be managed by integrating demands in an improvising fashion in which mutual respect is developed between design teams and their clients. Splitting is achieved by iterating between free thinking and bounded evaluation of possibilities (Andriopoulos & Lewis, 2010).

The 'diversity – cohesiveness paradox' addresses the conflict that arises from combining the breadth, that is achieved by diversity and individual contributions, with the cohesiveness that is necessary for groups of people to work effectively as teams. Design work is described as a group task, and creativity was found to stem from social interaction and collective inspiration of the group. The benefits of diversity brought about by varied individual contributions is desirable, while at the same time achieving the cohesiveness that is linked to shared goals and expectations are aids to performing effectively as a team. This is however not possible when experts protect their position strongly in high individualism style, in the process shutting down collaboration in a form of task conflict (Todorova, Bear, & Weingart, 2014). A too high focus on cohesiveness can also have detrimental effects by suppressing individual contribution and slowing down decision making in a drive to maintain consensus, while the formation of cliques between regular project team members was also cited as being detrimental to diversity.

The reported integrating mechanism to manage this paradox is to define success of the group in terms of the individual member's performance, while at the same time defining individual success based on the performance of the group. This effectively outlines the fact that individual success depends on the group and likewise, group success depends on individual success. The splitting mechanism described to address this specific tension resides in the physical separation of different specialisations that are required to effectively achieve product design outcomes,

giving the individual contributors space to live out their roles fully, while still being in close enough proximity to allow for creative collaboration (Andriopoulos & Lewis, 2010).

Andriopoulos & Lewis, (2010) reported that at an individual level energy is unlocked by the 'passion – discipline paradox', reporting that "passion fosters intrinsic motivation that builds commitment and excitement for the work, while discipline channels individuals' efforts from ideas to fruition" (p. 115). It was however found that in isolation passion or discipline can drain energy, with excess passion being associated with chaos, escalating obsession at an individual level and leading to inefficiency for companies, while excess discipline pushes for structure, standardisation and normatising in design, stifling inspiration, creativity and experimentation. In order to manage this paradox it was found that the lead firms utilise a practical artist identity to integrate passion and discipline in product design, while creative work, associated with passion, and routine work, associated with discipline, is separated in order to split the 2 aspects.

When ambidexterity is achieved in a contextual fashion the individual unit of analysis becomes highly relevant.

2.4. Individual ambidexterity

Individual ambidexterity is defined as "the behavioural orientation of employees towards combining exploitation and exploration related activities within a certain period of time" (Caniëls et al., 2017, p. 1099). As discussed in Chapter 1 the value of individual ambidexterity as a research topic has been established as implied by of the growing number of articles published that focus on this agenda. Even though the knowledge is widely dispersed across various industries (Pertusa-Ortega et al., 2020), a number of articles were found to be relevant to this current research project.

A number of recent studies focussed on the antecedents, enablers, and mediators and moderators of individual ambidexterity. Although there was a predominant focus on individual management employees (Booth, 2017; Mom et al., 2018; Swart et al., 2019; Turner, Swart, Maylor, & Antonacopoulou, 2016) some of the studies included managerial and non-managerial employees (Caniëls et al., 2017; Caniëls & Veld, 2019; Swart et al., 2019).

While some scholars focused on motivational orientations and aspects and how these contribute to ambidexterity (Caniëls et al., 2017; Mom et al., 2018), other focused on an action-oriented view of how employees achieve ambidextrous outcomes (Swart et al., 2019; Turner et al., 2016). Swart et al. (2019) studied the actions taken by employees in particular roles and at different levels of seniority in a UK-based professional service firm that enabled the employees to achieve ambidextrous work modes. Innovation performance also enjoyed focus since explore and exploit originally emanated from the balance to be struck between incremental and radical innovation (Caniëls & Veld, 2019; de Visser & Faems, 2015; Rosing & Zacher, 2017). Mom et al. (2018) set out to establish how firm HR practices influence individual ambidexterity in operations managers across different firm locations, and how factors internal to the individual mediated this influence on the achievement of individual ambidexterity. Caniëls et al. (2017) set out to establish how intrinsic motivation orientation and a perceived culture of empowerment, and a knowledge sharing culture influenced achieved levels of individual ambidexterity in Belgian service firms. Booth (2017) conducted research in multinational enterprises with the aim of identifying multilevel enabling and inhibiting factors to achieving ambidexterity. C. L. Wang and Rafiq (2014) investigated the influence organisational culture has on new product innovation, in a comparative study between UK and Chinese firms. Knowledge flows and how it relates to individual ambidexterity has also been investigated at the management level (Mom et al., 2007; Torres, Aqueveque, & Drago, 2015).

2.5. Factors that influence individual ambidexterity

A number of factors that influence individual ambidexterity has been reported in literature. This section covers relevant literature in this regard.

2.5.1. Knowledge flows and ambidexterity

When long- and short-term goals are experienced as contradictory is essential that knowledge and information be available to guide employees through the ambiguity. In one of the first studies on ambidexterity that focused on the individual level unit of analysis Mom et al. (2007) studied the influence that knowledge flows at different organisational levels have on the ambidexterity of managers. It was reported that

bottom up and horizontal knowledge flows increased exploration, while top-down knowledge flows increased exploitation. The implication is that a balance of top-down and horizontal or bottoms up knowledge flow was proposed to achieve individual ambidexterity (Mom et al., 2007). In a related study Torres et al. (2015) investigated the influence top down knowledge flows have on individual ambidexterity. It was reported that top-down knowledge flows improved middle managers achieved level of ambidexterity. This in turn improved predicted performance through improved strategic decision making (Torres et al., 2015). In the absence of guiding knowledge organisational culture may be a key driving force in the balance between explore and exploit.

2.5.2. Organisational culture

In a study that combined organisational culture elements and motivation orientation it was reported that in a high external motivation, high empowerment culture combination the expected levels of ambidexterity are higher for extrinsically motivated employees than for intrinsically motivated employees. In turn a knowledge sharing culture was found to be negatively related to explorative activities, with no reported influence on exploitative activities. This indicates that culture setting can be used to enhance or decrease the propensity of individuals to undertake explorative activities (Caniëls et al., 2017).

C. L. Wang and Rafiq (2014) also reported on the important role culture plays in contextual ambidexterity. In a comparison between UK and Chinese based firms it was found that an ambidextrous organisational culture was a differentiating factor in predicting new product innovation performance.

The implication of this to the current research is that organisational culture factors do influence individual ambidexterity.

2.5.3. HR practices

In a study of the effectiveness of HR practices to raise organisational ambidexterity and how it links to individual ambidexterity it was reported that high individual

ambidexterity levels contributed to higher achieved organisational ambidexterity. Firm opportunity enhancing HR practices were however reported to increase the achieved levels of organisational ambidexterity regardless of individual ambidexterity levels reported. This raises the point that HR practices can be effective at raising organisational ambidexterity even if it doesn't increase individual ambidexterity (Mom et al., 2018).

In related research it was reported that innovative performance was the highest when individuals specialised in either explore or exploit leading to an imbalance between explore and exploit. It was posited that a High-Performance Work System (HPWS) would moderate the relationship between explore, exploit, ambidexterity and innovation performance. It was however reported that the HPWS did not moderate the effects of balance or imbalance in levels of explore and exploit and innovation performance (Caniëls & Veld, 2019). This indicates that individual employee's orientation remains a determining factor in the outcomes at the individual level.

2.5.4. Individual factors

2.5.4.1. Motivational orientations

Caniëls et al. (2017) combined a motivational view on individual ambidexterity with aspects of organisational culture, specifically empowerment culture and knowledge sharing culture. It was reported that an empowerment culture encourages employees to undertake more exploration activities by increasing the intrinsic motivation orientation, while it had no discouraging effect on exploitative activities, increasing ambidexterity. Extrinsic motivation practices were found to enhance the influence of a culture of empowerment on ambidexterity in employees that are highly susceptible to external motivation.

In their investigation of firm HR practices and motivational orientation and how these influence achieved ambidexterity Mom et al. (2018) found that intrinsic motivation orientation and role breadth self-efficacy enabled the successful pursuit of individual ambidextrous goals at the individual level.

It can thus be concluded that employees' motivational orientations influence the effect that cultural components and HR practices have on their achieved individual ambidexterity.

2.6. Operationalisation of individual ambidexterity

2.6.1. Hierarchical differences in individual ambidexterity

In their research focussing on individual actions that enable managers to achieve ambidexterity, rather than motivational orientations, Swart et al. (2019) established that employees at different levels of the organisation utilise a different combination of ambidexterity enabling actions. The actions surveyed for were found to enable managerial ambidexterity in an earlier study conducted by Turner, Swart, Maylor, and Antonacopoulou (2016). The study focused on how different sources of intellectual capital interplayed in the achievement of ambidexterity in project settings and the influential actions were identified as buffering, gap-filling, integration, role-expansion and tone-setting. *Buffering* is an action undertaken by the individual to isolate the team from unwarranted distractions which may affect the team's completion of tasks, *gap-filling* as an action by managers is described as the manager completing tasks they know are necessary, but were not being performed by others, *integration* was described as the deliberate integration of knowledge and skills that is available in the team and its members, *role expansion* is an action in which the manager is necessitated to undertake more of their normal tasks, such as stakeholder communication, to address critical events, while *tone-setting* is described as the manager determining the work content and thus being in control of the tone (explorative or exploitative) of the work (Turner et al., 2016).

Swart et al. (2019) found that senior level employees were more inclined to adopt integration, role expansion, and tone setting as actions to enable ambidexterity, while buffering and gap-filling were most prevalent at more junior levels in the organisation. HRM practices that support the successful achievement of ambidexterity were also found to differ based on seniority. At the senior level recruitment, job rotation and development and the clan-based mechanism were identified as necessary practices, while at junior levels bureaucratic HRM mechanisms enabled gap-filling actions

(Swart et al., 2019). As for individual orientation, it is apparent that individual actions influence the achieved levels of ambidexterity and these actions vary along the corporate hierarchy. It is interesting to note that in this study it was reported that HRM systems enabled the action taken by junior employees and thus had an indirect effect at junior levels individual ambidexterity in contrast to the minimal direct individual effect reported by (Caniëls & Veld, 2019; Mom et al., 2018).

Booth (2017) examined individual top and middle managers' lived experience of the dilemma to balance demands to explore and exploit, and to identify enabling and inhibiting factors to individual ambidexterity. It was reported that the tension arising from the ambidexterity dilemma was resolved through a combination of synthesis (contextual ambidexterity), temporal separation and spatial separation (structural ambidexterity). Four core competencies were identified as instrumental to enabling managers to achieve ambidexterity balance, namely problem solving and change management, influence and persuasion tactics, team leadership and emotional intelligence (Booth, 2017). It should be noted that for non-managerial employees' spatial separation is not a feasible mechanism when explore and exploit has to be combined in a certain time since they are the providers of the necessary resources.

In their research on the relationship between organisational culture, contextual ambidexterity and new product innovation C. L. Wang and Rafiq (2014) reported on implications for hierarchical styles. It was reported that for contextual ambidexterity to flourish it is necessary for the management style to change from a top-down hierarchical control style to a bottom-up learning approach that recognises the contribution of individuals to shaping the ambidextrous culture.

2.6.2. Role transition

In other recent studies Tempelaar and Rosenkranz (2019) conducted research viewing individual ambidexterity through the identity theory lens, specifically how an employee transitions between roles. The combination of how an employee transitions between roles (segmenting or integrating predisposition), and being exposed to cross functional involvement was found to influence attained levels of individual ambidexterity. Integrators, described as employees with a propensity to integrate different roles were found to have a high tendency to act ambidextrously. In contrast segmenters, described as employees with a high propensity to isolate

different roles, showed lower levels of ambidexterity. The achieved level of ambidexterity was moderated by cross functional involvement in the case of segmenters, while integrators' ambidexterity declined when they were included in cross-functional teams (Tempelaar & Rosenkranz, 2019).

2.6.2.1. Sequential temporal cycling

A prominent theme in literature positions explore and exploit activities as incompatible activities that have to be done in an either-or fashion. In this school of thought it is proposed that, when it is necessary for individuals to combine explore and exploit, the only way to satisfy these conflicting outcomes in a certain period of time is to sequentially cycle between them (Andriopoulos & Lewis, 2009, 2010; Caniëls & Veld, 2019; Greco et al., 2019; Schnellbacher et al., 2019). Neurological studies have confirmed that strict explore and exploit activities utilise different parts of the human brain (Laureiro-Martínez, Brusoni, Canessa, & Zollo, 2015) and this has further strengthened the argument that the only practical way to achieve individual ambidexterity is by cycling between the two modes. Furthermore it has been reported that when ambidextrous demands are regarded as incompatible role-conflict may set in, with the severity of the role conflict dependant on individual factors (Gabler, Ogilvie, Rapp, & Bachrach, 2017). This is discussed in more detail under the literature review of known outcomes of individual ambidexterity.

Switching between explore and exploit however incurs switching costs in a similar fashion that task switching disrupts performance (Greco et al., 2019). Possible performance disruptions include loss of productive time due to cognitive inertia, an increase in the error-rate as the new task is engaged (Monsell, 2003; Schmitz & Voss, 2012) and a higher likelihood of distraction (Lu, Akinola, & Mason, 2017). To ensure that the benefits of individual ambidexterity exceed the costs it is imperative that switching costs be balanced with the benefits of ambidexterity as an alternative to individuals specialising in either explore or exploit (Greco et al., 2019; Pertusa-Ortega et al., 2020).

In contrast to the negative effects of task switching Lu, Akinola and Mason (2017) reported on a benefit of task switching in an ambidextrous context. By way of two experiments, it was found that rapidly cycling between tasks that require divergent and convergent thinking led to the highest levels of creative performance. The

increased creative performance was ascribed to reduced cognitive fixation which allowed for the reported higher levels of creativity (Lu et al., 2017).

In conclusion temporal cycling is viewed as the likely mode in which explore and exploit tasks can be combined in a certain period of time. It is however reported in current literature that there are costs and benefits to ambidexterity when it is achieved through temporal cycling and these have to be considered when organisations have to choose how to approach ambidexterity. A less prominent literature stream proposes that under the right conditions explore and exploit can be achieved in a simultaneous manner.

2.6.2.2. Simultaneous explore and exploit

The fact that explore and exploit has been found to use different cognitive processes strongly contests the possibility to achieve individual ambidexterity by exploring and exploiting in a simultaneous fashion (Pertusa-Ortega et al., 2020). This position is based on the assumption that two activities have to be undertaken to achieve two outcomes. In an alternative conceptualisation it is proposed that explore and exploit outcomes can be achieved in a simultaneous fashion. It is proposed that by adopting a paradox approach, in which it is acknowledged that it is possible to achieve a dynamic context in which explore and exploit is combined fluidly, explore and exploit can be achieved in a simultaneous, synergistic fashion (Miron-Spektor et al., 2018; Papachroni & Heracleous, 2020; Papachroni et al., 2015).

2.6.2.2.1. The paradox of contextual ambidexterity

In understanding why some individuals thrive under tension created by competing demands, while others struggle Miron-Spektor et al. (2018) proposed that paradox theory could provide a deeper understanding of ambidextrous tension and its outcomes. It was reported that the individual experience of competing demands, from a paradox perspective, can be described as a dilemma in which the tension is either relieved through compromise, or alternatively, individuals with a paradox mindset (“the extent to which one is accepting of and energized by tensions” (p. 26)) accept tension as natural and embrace the tension as a persistent occurrence which is fraught with opportunity (Miron-Spektor et al., 2018).

Papachroni and Heracleous (2020) proposed three paradox mechanisms that will aid in the pursuit of simultaneously exploring and exploiting: 'Hybrid tasks'; 'Capitalising on previous efforts'; and 'Seeking task synergies between exploration and exploitation'. In contrast to the general view that to achieve explore and exploit outcomes explore and exploit tasks have to be undertaken and that these tasks are incompatible (Andriopoulos & Lewis, 2009, 2010; Caniëls & Veld, 2019; Greco et al., 2019; Schnellbacher et al., 2019), it is proposed that it is possible to do single 'hybrid tasks' that serve both outcomes. By 'capitalising on previous efforts' it is proposed that individuals reassemble knowledge from prior experience in an ambidextrous manner. When the explore and exploit tasks are related it is possible to 'seek task synergies between explore and exploit', in the process progress in one mode contributes towards the other mode as well (Papachroni & Heracleous, 2020). Approaching individual ambidexterity in such a paradoxical manner allows for a more dynamic and fluid view of the compatibility of explore and exploit in practise (Miron-Spektor et al., 2018; Papachroni & Heracleous, 2020; Papachroni et al., 2015).

2.7. Outcomes

The firm level benefits of achieving ambidexterity is well represented in the ambidexterity literature and have enjoyed continued focus in the recent past (Luger, Raisch, & Schimmer, 2018; O'Reilly & Tushman, 2013; Raisch & Birkinshaw, 2008; Simsek et al., 2009). There is however limited research that report on the individual outcomes of achieving individual ambidexterity, with a further lack of studies that report on the negative outcomes of individual ambidexterity (Mu et al., 2020; Pertusa-Ortega et al., 2020). A number of outcomes has been published that were identified as relevant to the present research project and is discussed below.

2.7.1. Innovation performance

Rosing and Zacher (2016) conducted research on the relationship between ambidexterity at an individual employee level and innovation performance, with a specific focus on the explore-exploit balance. The explore-exploit balance is described as the combination of high or low levels of exploring or exploiting. It was reported that the highest innovation levels were achieved in a high exploit-high explore combination (Rosing & Zacher, 2017). In subsequent research (Caniëls and Veld (2019) reported that innovative performance increases as explore and exploit

increase in balance, i.e. move from low explore, low exploit in combination to high explore, high exploit. It was however reported that the highest levels of innovative performance were recorded when the employees specialised in either explore or exploit (Caniëls & Veld, 2019).

2.7.2. Role conflict

In one of the few studies to include negative outcomes of ambidexterity Gabler, Ogilvie, Rapp, and Bachrach (2017) conducted research on the outcomes of sales-service ambidexterity. Employees had the highest commitment to service quality and sales performance when they were focused on either service or sales. Although higher levels of creativity were reported as a positive outcome when employees combined sales and service orientations in an ambidextrous fashion, role-conflict was also reported as a negative outcome. It was further noted that both commitment to service and sales performance reduced under ambidextrous working conditions.

In early research into establishing suitable measures for role conflict Rizzo, House and Lirtzman (1970) reported that when employees face ambiguity and inconsistency in what is expected of them role-conflict sets in. Role conflict is associated with negative outcomes like stress, lower levels of job satisfaction and lower performance. From a role theory approach, it was posited that individuals would engage in coping behaviours to counteract the negative outcomes. When explore and exploit are viewed as incompatible, individuals may experience it as an inconsistency in what is expected of them if they have to do both explore and exploit work. This has led to role conflict being regarded as an area of interest in the individual ambidexterity literature (Gabler et al., 2017).

It was reported that individual differences influence the levels of dissatisfaction that ensues once role conflict is experienced (Johnson & Stinson, 1975), and this was also found to be true for individual ambidexterity based role conflict (Gabler et al., 2017; G. Wang, Liu, & Liu, 2019). A study of salesperson ambidexterity found that the employees preference towards competing tasks influenced the levels of role conflict experienced (Gabler et al., 2017). In related research agenda it was reported that IT employees' levels of experienced role conflict as an outcome of boundary spanning requirements was also dependant on their personal orientation towards explore and exploit (G. Wang et al., 2019).

2.7.3. Role overload

Although task variety and autonomy have been found to contribute to job satisfaction (Ali et al., 2014; Hackman & Oldham, 1975) it also contributes to the total load employees are expected to deliver on. In a related research stream role overload received focus in individual ambidexterity research. Role overload “occurs when role expectations exceed a party’s ability to respond effectively” (Cook & Hunsaker, 2001, p. 381). When explore and exploit are viewed as competing for the same resources role overload will occur when employees’ personal resources are depleted, leading to lack of performance and increased personal stress and pressure (Jensen, Patel, & Messersmith, 2013; G. Wang et al., 2019). In research reflecting the role HRM systems can play in these scenarios role overload was found to be exacerbated by High Performance Work Systems (HPWS). The negative outcomes of HPWS and role overload is mediated by perceived job control and autonomy, indicating the role job autonomy could play in addressing some negative outcomes (Jensen et al., 2013).

In their study on IT employees boundary spanning ambidexterity G. Wang et al. (2019) reported that employees’ orientation influenced the severity of the role overload experienced. Boundary spanning was separated in two modes, ‘transactional boundary spanning’, which is associated with conducting routine tasks using existing knowledge and ‘learning boundary spanning’ in which new knowledge has to be obtained to complete the task. In the IT literature these two modes are posited to be incompatible. It was reported that there was a significant relationship between transactional boundary spanning activities and the level of role overload experienced, while learning boundary spanning activities was found to not significantly influence role overload measures. This study also reported on the role ambidexterity plays in knowledge acquisition.

2.7.1. Knowledge acquisition

It was reported that the boundary spanning that was born out of ambidextrous demands increased the knowledge employees acquired from their peers in other departments. In turn this knowledge acquisition was reported to enhance the job satisfaction of employees. In another report of how orientations can influence the

outcomes it was reported that employees with a lower levels of learning goal orientation and achievement orientation only required a little knowledge to substantially increase their job satisfaction.

2.8. Individual ambidexterity topology

From the preceding literature it is evident that specific organisational aspects may either support or hinder individual ambidexterity depending on individual characteristics (Tempelaar & Rosenkranz, 2019), while different employees utilise different techniques to achieve individual ambidexterity. Identifying specific individual factors which influence the achievement of individual ambidexterity is therefor of value (Swart et al., 2019). Mu et al. (2020) conducted a systematic review of the literature on individual ambidexterity to establish how individual ambidexterity is contextualised in the literature and how specific contextualisation influence antecedents and outcomes. A typology to describe individual ambidexterity was proposed that considers individual ambidexterity at the hand of the relationship between exploring and exploiting at the individual level. It was proposed that the individual's view of ambidexterity as described by two dimensions, the balanced- and temporal dimension may explain some of the differentiation in the antecedents and outcomes of individual ambidexterity that are prevalent in the literature.

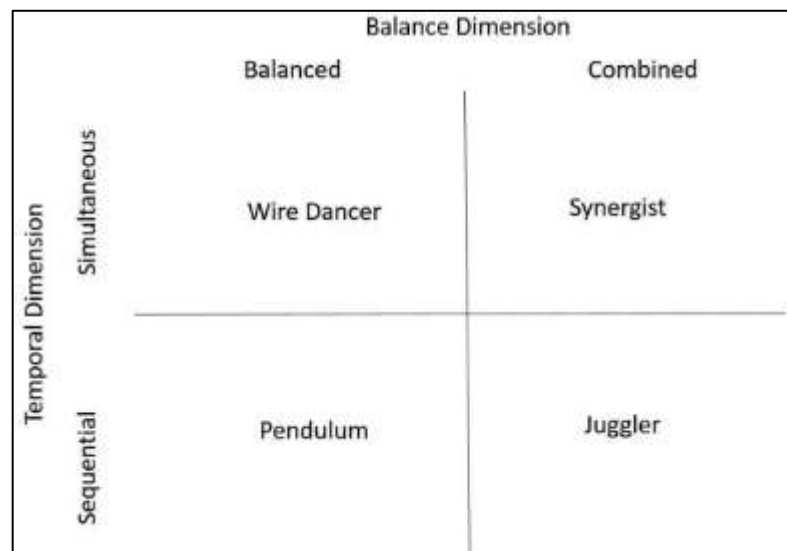


Figure 1: Individual ambidexterity typology Source: Mu et al., (2020)

2.8.1. Balance dimension

Cao, Gedajlovic and Zhang (2009) reasoned that the manner in which a firm balance between exploratory and exploitative activities contributed to firm performance. The approach to this dimension is grounded in whether explore and exploit activities is conceived as being conflicting, mutually exclusive occurrences, or whether it is possible to conduct exploratory and exploitative activities in combination. This balance view, which is aligned with the dilemma or paradox view of organisational tension described by Miron-Spektor et al. (2018), was adopted for the individual ambidexterity topology.

In the balanced dimension exploration and exploitation activities are viewed as incompatible and mutually exclusive endeavours and thus that a choice in favour of either is automatically a choice to not pursue the other. It is argued that a firm that neglects exploration will face an obsolescence risk, while neglecting exploitation will prevent the firm from capturing value that is achieved through improving incremental exploitation (Cao et al., 2009).

In the combined dimension explore and exploit activities are viewed as not being in competition and that the two activities can contribute in a complementary fashion (Cao et al., 2009). The balance contextualisation dimension is supported by a finding reported on by Booth (2017) that “there was little absolute consensus on the relationship between exploitation and exploration activities. Six managers saw the modes as competing for resources, six as independent and five saw the modes as complementary” (p. 100).

2.8.2. Temporal Dimension

Simsek et al. (2009) introduced the temporal dimension as part of their proposed typology to describe organisational ambidexterity conceptualisations. The temporal dimension “captures the extent to which ambidexterity is pursued simultaneously or sequentially over time” (Simsek et al., 2009, p. 867). In the sequential temporal dimension individuals will sequence explore and exploit activities, switching between the nature of activities in a temporal fashion, where-as in the simultaneous dimension individuals will strive to simultaneously explore and exploit (Mu et al., 2020).

2.9. Conclusion of literature review

From the preceding discussion it is concluded that individual factors such as motivation orientations, role identity, competencies and individual actions, as well as organisational culture and HRM practices, such as extrinsic motivation enhancement, cross functional involvement, bureaucratic mechanisms and job rotation, influence the achievement of individual ambidexterity and organisational ambidexterity. It is furthermore evident that achieving the correct balance of top-down and horizontal or bottoms-up knowledge flows can positively contribute to individual ambidexterity. It is furthermore evident that employees at different levels in the organisation are enabled to act ambidextrously in different ways, and that it is possible to achieve higher levels of organisational ambidexterity by raising individual ambidexterity levels, confirming the necessity of a better understanding of individual ambidexterity. Furthermore, the outcomes of ambidexterity are influenced by the choice of balance between explore and exploit magnitude. Categorising the operationalisation method and view of ambidexterity may provide much necessary granularity about the combinations of aspects that influence the achievement and outcomes of individual ambidexterity.

Beyond the presented literature and the identified gaps and motivation for further research at the individual level numerous calls for future research support this research agenda.

CHAPTER 3: RESEARCH QUESTIONS

To meet the stated research objective, answers will be sought to the following research questions:

Research Question 1: Establish how product designers achieve individual ambidexterity from a temporal perspective.

This research question was intended to explore the product designer's orientation to the temporal dimension, i.e. whether they cycle between explore and exploit, or whether it is done in a simultaneous manner in pursuit of ambidextrous outcomes. Isolating the temporal dimension for each participant further allowed for the type of individual ambidexterity to be determined in conjunction with Research Question 2 below, as proposed by Mu et al. (2020).

Research Question 2: Establish how product designers view individual ambidexterity from an ambidexterity balance perspective.

This research question was intended to explore how product designers view ambidexterity from the balance dimension, i.e. whether explore and exploit is a mutually excluding dilemma, or a paradox that is managed on a continuous basis. This question is aligned to the call for research in this regard made by Rosing and Zacher (2017). Isolating the balance dimension for each participant also allowed for the type of individual ambidexterity to be described in conjunction with Research Question 1 above, as proposed by Mu et al. (2020).

Research Question 3: Establish what the factors are that enable and inhibit individual product designers' achievement of individual ambidexterity.

This research question was intended to address the objective of identifying internal and external factors that influence the product designer's view and achievement of ambidexterity. This question is aligned with the call for studies that identify motivational and cognitive factors that influence individual ambidexterity that have not been reported on before (Mom et al., 2018), as well as the call for empirical studies that consider specific contextual factors (Mu et al., 2020).

Research Question 4: Establish what the perceived benefits and perceived negative outcomes are of achieving individual ambidexterity.

This research question was intended to address the objective of identifying the outcomes of individual ambidexterity. Mu et al. (2020) noted that positive outcomes of individual ambidexterity have been reported on in some studies, but that very few studies reported on negative outcomes of ambidexterity, this question will focus on both positive and negative outcomes of individual ambidexterity. This question is furthermore aligned with the call for empirical studies that investigate outcomes of individual ambidexterity in specific contextual settings (Mu et al., 2020).

CHAPTER 4: RESEARCH PHILOSOPHY AND METHODOLOGY

The objective of this research project was to gain a deep understanding of how product designers in the earth moving equipment manufacturing industry view (balance dimension) and experience individual ambidexterity; how individual ambidexterity is achieved (temporal dimension); and how this view and experience is influenced by internal and external factors. Finally, what the outcomes of individual ambidexterity is in this setting was explored.

The product designer's experience of ambidexterity is subjective since it is informed by personal experience. Gaus (2017) explained that when interpretivists study a phenomenon it is viewed as being subjective in relation to how the subject experiences it, hence the philosophy of the research was interpretivism.

Little is known or published about the influence of the balance and temporal dimensions and related individual outcomes of ambidexterity as reflected in two recent systematic reviews of individual ambidexterity literature (Mu et al., 2020; Pertusa-Ortega et al., 2020). The inductive reasoning approach to theory is used when specific observations and human experiences are developed into broader generalisations and theories (Saunders & Lewis, 2018). The objective of gaining a deep understanding of product designers' experience of ambidexterity based on underexplored dimensions was congruent with an inductive approach to theory. For this reason, an inductive research approach in which the researcher builds concepts and theory based on data gathered was followed.

Qualitative research methods are suitable when research has the aim of determining how people interpret and experience things (Merriam & Tisdell, 2016). The aim of this research was to gain a deep understanding of product designers' experience of individual ambidexterity and a qualitative method was subsequently selected. Merriam and Tisdell (2016) describe a basic interpretivists qualitative study as a qualitative study that does not fit in a specific epistemological framework. They report that this is especially prevalent in applied sciences like business. This research project did not align with any of the epistemological frameworks described in Merriam and Tisdell (2016) and thus it is categorised as a basic qualitative study.

Saunders and Lewis (2018) describe exploratory research as “research that aims to seek new insights, ask new questions and assess topics in a new light” (p. 115). Given that the objective of the research was to gain a fresh and deep understanding of the individual product designer’s experience of ambidexterity at the hand of the individual ambidexterity topology proposed by Mu et al., (2020), and that very little had been reported on this topic prior to this research, the research was guided by an exploratory purpose.

The aim of this research was to gain a deep understanding of individual product designer’s experience of ambidexterity and its outcomes at a given time, and data was collected in a short time span. Saunders and Lewis (2018) describe a cross-sectional study as “a study of a particular topic at a particular time” (p.130). Thus, the time horizon of this research was cross-sectional.

Semi-structured interviews allow the researcher to explore aspects of the individual product designers’ views and experiences of individual ambidexterity (Saunders & Lewis, 2018). Semi-structured interviews also present the researcher with the opportunity to ask further probing questions to explore objectives in further depth or clarify uncertainty (Merriam & Tisdell, 2016; Saunders & Lewis, 2018). This implies that semi-structured interviews are well suited to the objective and, for this reason, semi-structured interviews were conducted to collect data.

4.1. Population

Robinson (2014) compiled a practical guide to sampling in qualitative research that use interviews as the data collection method. Robinson advised that to clearly define the population a set of inclusion and/or exclusion criteria, that is aligned with the purpose of the study should be used.

The aim of this research was to gain a deep understanding of individual product designers’ experience of ambidexterity and its outcomes. This would by implication mean that possible subjects must have experienced and met ambidextrous demands. For this reason, the study was limited to employees who articulated demands of individual ambidexterity as part of the interview, and employees who did not were excluded from the population. Given that substantial research had been conducted on how managers view and experience ambidexterity (Booth, 2017; Mom

et al., 2007; Zimmermann, Raisch, & Birkinshaw, 2015) this research aimed to respond to calls for research that focuses on non-managerial employees (Mu et al., 2020). For this reason, the population was further limited to non-managerial product designers who had to act in an ambidextrous manner to successfully complete tasks. Product designers who are tasked with improving existing products in a stable manner to minimise disruption in downstream processes, while at the same time working on tasks that carve out future stepwise improvements is a practical example of the way in which product designers have to act ambidextrously. To ensure that the population met these requirements the participants were asked to describe explore and exploit in their work as a screening question. Furthermore, the head of the design department, in which the participants are employed, reviewed the list of participants and confirmed that each of them did have complete explore and exploit tasks in the normal execution of their duties.

Given that individual experience of phenomena is subjective, and the purpose of this study was to gain a deep understanding of individual experience of ambidexterity, a homogenous sample was targeted. Saunders and Lewis (2018) advises that a sample consisting of a particular sub-group will provide minimum variation, which will allow characteristics to be explored in greater depth and minor differences to be more apparent. This sample choice is also a response to the call by Mu et al., (2020) and (Pertusa-Ortega et al., (2020) for empirical research into individual ambidexterity in specific work contexts and organisational levels. In order to support homogeneity, the sample was further limited to product designers who work in the earth moving equipment manufacturing industry, an industry segment to which the researcher could secure access to a suitably sized population while still maintaining homogeneity. This research was conducted as part of a manufactured focus curriculum and this population furthermore supported achieving a manufacturing industry context.

The population can thus be described as product designers working in the earthmoving equipment manufacturing industry, who had to achieve individual ambidexterity in the execution of their work.

4.2. Unit of analysis

The research aims and research questions were postulated on the level of individual employees. The aim was to gain deep knowledge of individual's views of ambidexterity. In line with this objective the unit of analysis was individual employees. Consistency in the unit of analysis, research and literature was supported by the use of the consistency matrix that is attached in Appendix B.

4.3. Sampling method and size

When a sample frame is not available the sampling method is described as non-probability sampling (Saunders & Lewis, 2018). A sampling frame of product designers working in the earthmoving equipment manufacturing industry was not available. Furthermore, it was not practical to identify and conduct interviews with all product designers working in the earthmoving equipment manufacturing industry. As such a non-probability sampling method was deployed.

Purposive sampling is a non-probability sampling form that relies on the researcher's judgement to select the sample members (Saunders & Lewis, 2018). The sample was limited to participants the researcher had access to through their professional network. To ensure that the sample was matched to the purpose of the research Interview Question 1 was included as a screening question and as such the sampling method was purposive sampling.

As described in the sample population the sample was purposefully selected to achieve homogeneity in order to support the aim of gaining a deep understanding of individual's experiences (Saunders & Lewis, 2018). All of the participants were employed as product designers by a single company that designs and manufactures equipment for the earthmoving industry at the time of the interviews. The company recently embarked on a strategic direction to develop new products, while at the same time incrementally improving existing products, with both these endeavours executed in a single R&D team. This was an example of the firm striving for exploratory and exploitative innovations (Mom et al., 2018). Homogeneity in the sampled population allowed individual characteristics to be explored in greater depth and minor differences to be more apparent (Saunders & Lewis, 2018).

In qualitative research a suitable sample size is not a definite number. The sample size should be determined with considerations for a variety of aspects including the suitability of the sample to the type of study, as well as practical considerations such as the time available to gather and process data recorded from the sample (Merriam & Tisdell, 2016). Fusch and Ness (2015) explains that once no new themes and no new data emerge from interviews a point of saturation is reached. Guest, Bunce, and Johnson (2006) reported that in studies where individual views or experience is studied in homogenous, purposive, non-probabilistic samples it is reasonable to expect saturation in a sample of twelve participants. In a response to the work Guest and Bunce did Hagaman and Wutich, (2017) reported that sample sizes ranging from twelve to sixteen may be adequate in studies involving homogenous populations on focused topics. A total of thirteen semi-structured interviews were conducted in this current research project. Saturation is discussed further in section 4.5.

4.4. Data gathering instrument

Interview guidelines guide the researcher during interviews (Saunders & Lewis, 2018). Given that the data gathering technique used was semi-structured interviews the measurement instrument that was used is a semi-structured interview guide. Kallio, Pietilä, Johnson, and Kangasniemi (2016) asserted that the quality of the interview guide has a fundamental influence on the quality of the research end result.

Ethical considerations should prevail throughout the research process. From an ethical perspective it is necessary to ensure that the research questions do not have the potential to cause any harm to the participants and that only data which is aligned with the research intent is gathered (Kallio et al., 2016). The interview guide guided the researcher and ensured that only data that was relevant to the research was gathered. The consistency matrix that is attached in appendix B was used to ensure that the interview guide only addressed the relevant aspects under investigation, and that interview questions were aligned with presented literature and the research questions. Table 1 below shows how the questions in the interview guide maps to the research questions discussed in Chapter 3.

Table 1: Mapping of Research Questions to Interview Questions

Research Question	Semi structured interview questions
Sample screening question to gauge the participants understanding of the concepts and to confirm that the participant understands the concept of explore, exploit and ambidexterity and does face ambidextrous demands in the execution of their role.	Q1 Tell me about exploring and exploiting in your role?
Research Question 1: Establish how product designers achieve individual ambidexterity from a temporal perspective.	Q2a Can you tell me how you schedule your work to accomplish both? Q3a Is it a choice between either explore or exploit or is it possible to do both at the same time?
Research Question 2: Establish how product designers view individual ambidexterity from an ambidexterity balance perspective.	Q2b Can you tell me how you allocate time between exploring and exploiting activities? Q3a Is it a choice between either explore or exploit or is it possible to do both at the same time? Q3b What do you believe are the trade-offs of exploring and exploiting at the same time?
Research Question 3: Establish what the factors are that enable and inhibit individual product designers' achievement of individual ambidexterity.	Q4a Tell me about factors you regard as enabling your own ambidexterity? Q4b Which of the factors do you deem most dominant and why? Q5a Tell me about factors you regard as inhibiting your own ambidexterity? Q5b Which of the factors do you deem most dominant and why?
Research Question 4: Establish what the perceived benefits and perceived negative	Q6a Tell me about the positive aspects of having to explore and exploit at the same time?

<p>outcomes are of achieving individual ambidexterity.</p>	<p>Q6b Tell me about the negative aspects of having to explore and exploit at the same time?</p> <p>Q7 How does it make you feel to have to explore and exploit in a given time period?</p>
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As already noted, a screening question was included in support of the sampling process to confirm that candidates actually faced ambidextrous demands in their work. The research questions, which was informed by existing literature and calls for research, informed the bases of the remaining questions in the interview guide. An initial interview guide was tested successfully during a pilot interview. After further three interviews it became apparent that some aspects were discussed to a lesser depth than was anticipated when the original interview guide was developed and piloted. In order to address this some adjustments were made to the originally piloted interview guide as noted below.

4.4.1. Multi-faceted questions: Enablers/Inhibitors; Positive/negative

The original interview guide posted these questions in the multi-faceted form asking for positive and negative aspects in a single question. It was found that participants would in their response focus on either and neglect the other, for this reason the questions were adapted to be single sided questions. In order to put the participant at ease and explore as much of the research area as possible semi-structured interviews are meant to be more of a conversation than a question-and-answer session. Semi-structured interviews allow the researcher to adapt to the flow of the interview and the information that emerges from the interview because the order of the questions to discuss is not pre-determined (Merriam & Tisdell, 2016).

4.4.2. Clarity of meaning: Ambidexterity

It was observed that participants found the term ambidexterity unfamiliar since the participants didn't really have a reference point for it. In interviews five to thirteen "ambidexterity" was either replaced with, or supported by the expression "expectations to perform both exploratory (discover, search, experimentation) and

exploitative (refinement, incremental change, efficiency driven) tasks" and this was found to be much more relatable to participants.

4.5. Data gathering process

Data was gathered by conducting a total of thirteen interviews with product designers. In order to alleviate geographical limitations, and other restrictions of movement that was imposed due to the Covid-19 pandemic, the interviews were conducted on a synchronous online/internet-based conferencing platform. Only a single participant had a camera available as part of the interview process. This limited the observable non-verbal cues to changes in the participant's tone of voice and word choice.

Interviews were conducted after ethical clearance approval was confirmed by the University of Pretoria. A copy of the ethical clearance confirmation is attached in Appendix C. All participants were informed of the purpose of the research and voluntarily participated in the interviews. Participants were made aware of the fact that interviews would be recorded to allow for accurate transcription and analysis. Only data from consenting participants was included in the research project.

Due to the unfamiliarity of the population with the terms and concepts that embody this research topic all participants were briefed on the purpose of the research and what is meant by the terms explore, exploit and ambidexterity, when interviews were requested. The explanation sheet used to achieve this brief was also included in the electronic interview calendar request, along with the ethical clearance statement. A sample of this sheet is included in the introduction section of the interview guide in Appendix B.

Handwritten notes were kept during the interview to keep track of what had been covered in conversation and ensure all relevant aspects of the interview were covered. The handwritten notes also allowed the researcher to become familiar with the interview content as the interview unfolded and allowed for specific aspects to be identified to probe deeper or request clarification from the participant.

All of the interview recordings were prepared for analysis by transcribing the interviews verbatim. The data gathering process was continued in conjunction with analysis of already gathered data (handwritten notes, recordings and transcripts) until no new findings emerged in the analysis process, indicating that a point of saturation had been reached (Fusch & Ness, 2015). Figure 2 below shows the number of new codes that emerged from each interview that was analysed. The graph indicates that no new codes were identified in the analysis of the last interview and that saturation had been reached.

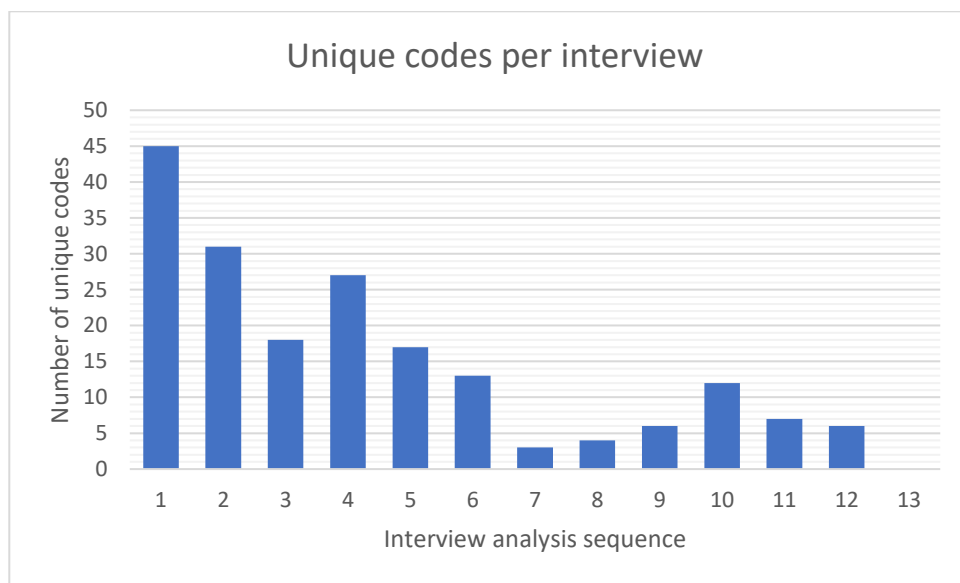


Figure 2: Number of codes identified per interview analysed

4.6. Analysis approach

Merriam and Tisdell (2016) describe data analysis as a process that is conducted to “make sense out of the data”, which involves “consolidating, reducing and interpreting what people have said and what the researcher has seen and heard” (p. 202). Linneberg and Korsgaard (2019) describe coding of qualitative data as an important tool to turn raw qualitative data into a narrative, and continue that it makes large amounts of data easily accessible for thematic categorisation and analysis. To allow for analysis the interviews were transcribed electronically, and analysed using ATLAS.ti 8 thematic analysis software.

The analysis steps as proposed by Merriam and Tisdell (2016) is category construction, which includes coding and assigning codes to categories. Coding is

described as the process in which the researcher assigns “some sort of shorthand designation to various aspects of your data so that you can easily retrieve specific pieces of the data” (Merriam & Tisdell, 2016, p. 199). This is followed by sorting categories of data, rationalising categories to a manageable number and thereafter making inferences and/or developing theories and models. This proposed approach was followed in a cyclical manner, conducting interviews and then transcribing and coding already conducted interviews in parallel to conducting later interviews. This allowed the researcher to hone the interview approach and to probe specific aspects in later interviews that were identified as relevant in the analysis of earlier interviews. Merriam and Tisdell (2016) describes this process as part of the process in which saturation is achieved, where-in the researcher moves from an inductive approach where new meaning is derived from the data, to a more deductive approach in the last interviews, where confirmation of earlier findings is sought from the data, but keeping an open-mind for new possibilities.

4.7. Quality controls

Merriam and Tisdell (2016) devoted an entire chapter to quality control in qualitative research, while Seale (1999) devoted an entire book to the topic. This is indicative of the vast extent to which the topic can be described. The critical aspects to cover in ensuring quality relates to validity, reliability and bias. Seale (1999) closes his first chapter with a conclusion that “we need to accept that ‘quality’ is a somewhat elusive phenomenon that cannot be prespecified by methodological rules” (p. 7)

Merriam and Tisdell (2016) described data validity as “the extent to which research findings are credible” (p. 265). Validity will be supported by keeping detailed field notes and reflective commentary, recording and transcribing all interviews, keeping coding records and by confirming interpretations with participants (Merriam & Tisdell, 2016). The interview guide was informed by previous research into similar or the same constructs as proposed by Merriam and Tisdell, (2016). To ensure completeness of the interview guideline and to allow the interviewer to gain confidence in conducting interviews a pilot interview was conducted (Saunders & Lewis, 2018).

Since the data that was collected was of a subjective nature, and in particular based on the participants lived experience the only feasible method of obtaining the data

was by capturing self-reported responses. As already reported, it was confirmed by the functional manager that the participants explore and exploit as part of their daily work. In addition to this the following steps which were taken to address possible common method bias that could arise from the use of self-reported data was adopted from other similar research (Caniëls et al., 2017; C. L. Wang & Rafiq, 2014): Questions were presented clearly and framed in a manner suitable to the context (Salkind, 2007); Respondents were assured of confidentiality and that reported data would be anonymised (Caniëls et al., 2017; Salkind, 2007; C. L. Wang & Rafiq, 2014); Furthermore, respondents were made aware that the purpose of the research was to learn about their own lived experience and that there were no desired answers (Caniëls et al., 2017).

Data reliability can be described as “the extent to which there is consistency in the findings” (Merriam & Tisdell, 2016, p. 265). Reliability will be ensured by documenting all processes as they are followed and consistently applying these same methods in a consistent manner.

From a research and analysis point of view interviews were conducted and continuously analysed until saturation was indicated by the analysis result.

4.8. Limitations

The following limitations to the research project are noted based on the research methodology design that was followed:

- Sampling was done on a non-probability sampling base from the researcher’s professional network. This bounds the study’s generalisation possibilities.
- The interview participants are all employed by the same firm, instilling firm specific bias into the results, further limiting generalisation possibilities. An example of firm specific bias is the fact that the firm does not have a formal performance management system in place, with the end result that findings that relate to performance management and its influence on the individual’s lived experience of ambidextrous work demands being highly unlikely.
- The researcher’s level of experience in conducting semi-structured interviews and analysing qualitative data was limited to the current study at the time of completing this research project and is thus stated as a possible limitation. This limitation was circumvented as far as possible by attending formal

workshops related to the methods, supervisor consultations, using pilot interviews to test the instrument, and continually referring back to the consistency matrix to ensure that all actions are aligned with the intended research purpose and design.

- All interviews were conducted over the internet, thus excluding participants who aren't familiar with this technology (Saunders & Lewis, 2018). This is not regarded to be substantive limitation since the target sample worked in a company that readily made use of internet communication before interviews were conducted.
- With interviews having been conducted over the internet the opportunity to detect non-verbal cues such as discomfort around specific themes or questions was limited to word choice and tone of voice of participants.
- The researcher was previously employed in a product designer role in the target population and thus the researcher also has personal experience of the phenomenon being researched. The researcher used field notes and reflective commentary to detect underlying bias. Bias was further limited by positioning the research in extant literature and ambidexterity constructs rather than on the researchers own experience and views, while the antecedents and outcomes were explored both from a positive and negative light in the interview process.
- The researcher was personally acquainted with the sample and this in itself could have influenced the depth to which the participants offered information perceived as negative. In order to address this limitation no data that could reveal the participants' identity is reported. Further to this, participants were assured that all responses would be anonymised upon reporting, and only consenting participant's interview responses were reported on.
- All participants are male and this may limit the breadth of antecedents and outcomes identified. However, gender dimensions are outside the scope of this study and all participants are representative of the intended sample population, being non-managerial product designers who have to achieve ambidextrous outcomes in the completion of their daily work.
- All of the data recorded and on which the analysis and findings are based is self-reported. Steps were taken to minimise the impact of self-reports on the data validity as described in section 4.7.

CHAPTER 5: RESULTS

5.1. Introduction

In this chapter the results of the research process that was followed to answer the research questions introduced in Chapter 3 are presented. The objective of the study was to gain a deep understanding of how product designers in the earth moving equipment manufacturing industry view (balance dimension) and experience individual ambidexterity, how individual ambidexterity is achieved (temporal dimension), how this view and experience is influenced by internal and external factors and what the outcomes of individual ambidexterity is in this context. The research questions were informed by extant literature on the topic and derived from calls for future research as discussed in Chapter 3. The results were obtained by conducting interviews with a sample of thirteen product designers who face demands to explore and exploit in a certain period of time. Consistency and coherence between extant literature, the research questions, data gathering instrument and the analysis approach was ensured by continually referring back to the consistency matrix presented in Appendix A.

As noted in chapter 4 all interviews were transcribed verbatim. The researcher personally conducted and transcribed all interviews and, in the process, gained deep insights of the content of the interviews. This was followed by the coding and thematic analysis process. All transcripts were reviewed once more and portions of relevant data highlighted for further review and analysis, creating bits of data. This was followed by the coding process, in which each bit of data was assigned a descriptive code. Every code was worded so that it had meaning when read on its own and every data bit was assigned to a single code. This was done using Atlas.ti 8 software, which allows for full visibility of the source of each bit of data.

Once codes were derived from the data bits of each interview the entire code list was reviewed for duplicates. Duplicate codes were combined to ensure that a list of unique codes was maintained throughout the analysis process. The unique codes were assigned to themes, or secondary constructs, that collectively answer the different research questions. This process of assigning codes, reviewing and assigning codes to groups was repeated for every interview and every research question. In a consolidation step the different secondary constructs were reviewed

to ensure a consistent level of abstraction was maintained, with some constructs split up and others combined. An example of deliberately maintaining a consistent level of abstraction is the fact that some participants viewed individual ambidexterity as being achieved at a task level, while others viewed it as being achieved on a project level as discussed in 5.3.1. In a final step the themes were grouped together in primary constructs, or categories which consolidate the results in high level themes. With each code only allocated to a single theme and each theme only allocated to one category. As part of the consolidation step record was kept of the number of references that relate to each code, theme and category.

Whenever a frequency or cumulative count is included in results it is the total number of participants' whose responses were categorised under the specific construct, rather than the total number of times an observation was made that relates to a specific construct. This is done to prevent the counts from being skewed by repeated references to specific factors. This could occur when interview participants are very vocal about a specific aspect, in contrast to participants who use words sparingly (Guest et al., 2006).

The balance of this chapter is devoted to the presentation of the research results. In each instance the primary constructs that relate to the specific section is presented, followed by a detail presentation of each primary construct, it's secondary constructs and the relevant supporting data.

The presentation of the results starts with a description of the sample of product designers that were interviewed in section 5.2, followed by a presentation of the participants' view of explore and exploit in section 5.3. Although the specific results regarding the product designers' view of explore and exploit does not relate directly to any of the research questions, it does present information that captures some of the context and is thus deemed insightful and relevant to the study. This is followed by a presentation of the relevant data gathered and analysis results at the hand of the each of the research questions, and as guided by the interview questions. In section 5.4 the results of Research Questions 1 and 2 are presented, and combined in the form of the Individual Ambidexterity topology proposed by Mu et al., (2020). In section 5.5 factors that enable and inhibit individual ambidexterity is reported on in response to Research Question 3. The results presentation is concluded with a

presentation of the recorded outcomes of individual ambidexterity in response to Research Question 4 in section 5.6 and a chapter conclusion in section 5.8.

5.2. Description of the sample

The aim of this research project was to gain a deep understanding of how individual product designers view and experience ambidextrous work demands. The sample relevance to the study is discussed in section 4.3. The sample was limited to non-managerial employees employed as product designers, working in the earthmoving equipment manufacturing industry.

A total of 13 interviews were conducted with product designers employed by the same firm. The achieved sample can be described as a homogenous sample according to the working conditions and environment they are exposed to, work processes, typical work content and demands. This is aligned with the sampling purpose that was described in section 4.3. The participant's tenure as product designers is reflected in Table 2 below

Table 2: Experience of the sample population

Participant	Experience as product designer [Years]	Experience satisfying demands to explore and exploit [Years]
A	18	10
B	13	13
C	8	6
D	9	6
E	10	5
F	4	4
G	13	13
H	20	2
I	14	10
J	18	4
K	9	9
L	26	21
M	13	5

The participant's tenure as product designers ranged between 4 years and 20 years, while the time the product designers had been working in an environment that demanded ambidextrous product design demands ranged between 2 and 13 years. As noted in section 4.1 it was confirmed that the sample population do have to meet ambidextrous demands to perform their work by way of a screening question as well as through enquiry with the senior manager responsible for the entire design team. It can be concluded that the achieved sample met the intended sample composition. In the following section the participants' view of explore and exploit is presented.

5.3. Explore and exploit in the eye of individual product designer

The product designer's view of explore and exploit was not included as an explicit outcome in the research design. It does however offer some insight into how the two aspects are viewed, providing much needed context to the rest of the results presentation. The responses that informed the product designers' view of explore and exploit was not uncovered through a specific interview question, but rather captured in statements that were made throughout the interviews. Whether explore and exploit are achieved at a task or project level, and the nature of explore and exploit in isolation deemed to be relevant to the research context and is presented in the following sub-section.

5.3.1. Unit of analysis

While the research was conducted at the individual unit of analysis, consistent with the research design, the level at which the individual participants position the ambidexterity tension and differentiated between explore and exploit varied between the individuals allocated design projects or task level. Tasks describe portions of work that can be completed in isolation, while design projects are a collection of tasks or activities that are combined to meet a deliverable or outcome. While many participants positioned complete projects as being of exploratory, exploitative or combined nature, others preferred to consider the nature of tasks that they had to complete and categorised the tasks as explore or exploit based on the task content. This was considered during the coding and analysis phase with codes constructed in general, and not on a task or project level to address this.

5.3.2. Participant's view of explore

The definitions of explore and exploit were discussed in the interview request, and also as part of the interview brief at the start of each interview. Exploration was described as including “things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation” (March, 1991, p. 1). In response to this categorisation the explore content of product designer's work was described as the most enjoyable and most satisfying part of the design process. It was also described as the creative part of product design, and being more mentally challenging. Eight participants openly declared a personal preference for explore over exploit with the general position captured by one of the participants saying “*thank heavens there is an exploratory part of our job because... the explore part is the nice part*”.

5.3.3. Participants view of exploit

Exploitation was described in the interview brief as including “such things as refinement, choice, production, efficiency, selection, implementation, execution” (March, 1991, p. 1). In the interviews five participants described exploit related design work as being undesirable, using terms “*less fun stuff*”, “*not nice*” and “*not always the exciting job*” to describe it, while one used metaphor to describe the exploit tasks' desirability “*the exploitation part is eating the vegetables part of the process*”. In contrast to the explore work being described as the creative part of the work, two participants described exploit work as “*a process of looking at numbers*”.

While these mostly negative connotations were raised with regards to exploitative activities, the importance and necessity of the exploit work to short-term survival was acknowledged by three participants. This notion that is captured well in the following statement: “*if we do the exploit type work well, we sell more machines and that obviously keeps all of us employed*”. For this same reason exploit related tasks were described as typically enjoying higher priority and urgency than explore tasks.

5.3.4. Conclusion of participants view of explore and exploit

It can be concluded that in the sample population there are strong indications that explore work is preferred over exploit work. It can furthermore be added that the sample population acknowledged exploit work as important and necessary for short term survival. The balance of this Chapter is devoted to presenting the remaining

results in relation to the specific research questions in chronological order starting from Research Question 1.

5.4. Results for Research Question 1 and 2

Research Questions 1 and 2 were constructed in combination to describe the individual product designers view of ambidexterity as experienced and achieved by individuals and to test the individual ambidexterity topology as proposed by Mu et al., (2020). Evidently the research questions are closely related and for this reason the results are discussed in combination.

5.4.1. Results for Research Question 1: Temporal dimension

Research Question 1: Establish how product designers achieve individual ambidexterity from a temporal perspective.

The temporal dimension “captures the extent to which ambidexterity is pursued simultaneously or sequentially over time” (Simsek et al., 2009, p. 867). This research question intended to explore the product designers’ orientation to the temporal dimension. Isolating the temporal dimension for each participant further allowed for the type of individual ambidexterity to be determined in conjunction with Research Question 2 below, as proposed by Mu et al. (2020). As reflected in Table 1 interview questions 2a and 3a were included to answer this research question.

The constructs that emerged from the interviews that are related to how product designers view the temporal dimension is shown in Table 3 below, followed by a discussion of the most prominent constructs.

Table 3: Constructs related to product designer's view of temporal dimension of ambidexterity

Primary construct	Secondary construct	Frequency
Ambidexterity is achieved by switching between explore and exploit	Explore and exploit use different cognitive functions	4
	You can't explore at will	2
	Focused explore and exploit is more efficient	1
Ambidexterity is achieved through simultaneous explore and exploit	No cognitive differentiation between explore and exploit	2
	Mind wanders between explore and exploit	1
	Continuously looking for solutions	1
	Beginning with the end in mind	1
Temporal approach depends on other factors	Task relatedness determines if explore and exploit can occur simultaneously	2

5.4.1.1. Switching between explore and exploit or not

A theme that manifested itself in four of the interviews that relates specifically to the temporal dimension and achieving ambidexterity by switching between explore and exploit, is an indication that explore and exploit requires different cognitive functions. When describing why it is necessary to cycle between explore and exploit in a temporal fashion one designer noted that *"you do have to switch off the creative bit of your brain and think about the less palatable boring part"*.

In a related construct two participants reflected on the experience that it is not just a matter of exploring new design possibilities when they have some time available. When the opportune moment arises to be creative and experimental that opportunity should be harnessed, as one designer noted *"you cannot schedule on inventive work, you cannot just sit down and go today I'm going to invent"*, with another stating that

“if I am in the mood for new product development and I feel the creative juices flowing, then obviously I'm going to try and focus my time on that”.

In contrast two participants reported that they achieve explore and exploit in a simultaneous fashion and that for them there is no differentiation between the two approaches. In this regard one participant described their experience as follows: *“for me it's a fairly grey area. Both of them, I do both together. When doing new designs, then doing exploiting and exploring work same time, for me it's like an almost say like a blur”.* They went on to state that their mind wanders between exploration and exploitation in a continuous fashion *“if you start designing some part of the product you would start up with some concepts and most of the times I would probably immediately try and ... see where the weak points are, where do I need to concentrate on the way. Where will it help to ease production, so my brain immediately starts thinking of those sites while I'm busy with exploring”.*

In sum the results indicate that the participants reported different operationalisations of individual ambidexterity.

5.4.1.2. Temporal simultaneity depends on the task

A number of interviewees reported that the whether they switch between explore and exploit or approach explore and exploit in a simultaneous fashion depends on how related the explore and exploit tasks are. As one interviewee explained *“if the incremental improvement is somehow linked to the exploration then it's much easier to keep these things in context and separate them for me and personally to look at one section and then consider the other section, because it's kind of topical. But it becomes more challenging for me if it's if it's two completely separated things.”*

It can be concluded that the temporal dimension of individual ambidexterity is a dynamic phenomenon that is not only dependent on the individual's general view, but that contextual factors such as the characteristics of the specific task also plays a role in how ambidexterity is achieved.

5.4.2. Results for Research Question 2: Balance dimension

As noted in Chapter 2 another possible dimension along which individual ambidexterity can be described is the balance dimension which deals with whether explore and exploit are viewed as mutually enabling activities which can be combined in a synergistic fashion or if it is viewed as conflicting endeavours that fight for the same resources and thus doing more of the one inadvertently leads to less of the other.

Research Question 2: Establish how product designers view individual ambidexterity from an ambidexterity balance perspective.

This research question was intended to explore how product designers view ambidexterity from the balance dimension. Isolating the balance dimension for each participant also allowed for the type of individual profile to be described in conjunction with Research Question 1, as proposed by Mu et al. (2020). As reflected in Table 1, in Chapter 4, interview questions 2b, 3a and 3b were included to answer this research question.

There was a general consensus from the participants that a combination of explore and exploit activities is required to achieve successful design. However, the interview participants were highly polarised in their view of the practicality of individual ambidexterity from the balance perspective. Seven participants noted that explore and exploit are conflicting endeavours that one has to choose between while six participants noted that these are synergistic activities that should be combined for the best outcome. The constructs that emerged from the interviews that describe the product designer participants' view of the balance dimension is shown in Table 4 on the next page followed by a discussion of the most prominent constructs.

Table 4: Constructs identified describing product designers' view of the balance dimension of ambidexterity

Primary construct	Secondary construct	Frequency
Explore and exploit are conflicting endeavours requiring dedicated resource allocation to achieve either	Doing more of the one inevitably means doing less of the other	2
	Explore and exploit are competing activities	2
	No explicit rationale offered	4
Explore and exploit can be combined in a synergistic manner	Exploit learning informs future explore and vice versa	3
	The 2 triggers or fuels each other	1
	Don't distinguish between explore and exploit	1
	No explicit rationale offered	3
	Task relatedness determines if explore and exploit can be combined in a synergistic fashion	1
Whether or not explore and exploit can be combined in a synergistic manner depends on other factors	Task relatedness influences the extent to which explore and exploit are synergistic	1

In exploring whether the thirteen product designer interview participants view individual ambidexterity as a process in which a balance should be struck between explore and exploit some underlying constructs were identified by analysing the interview transcripts.

5.4.2.1. Balance to be struck or synergy to achieve

Seven participants reported that they view explore and exploit as conflicting or mutually exclusive activities and that deliberate resource allocation to both is

necessary in order to achieve both outcomes. Explore and exploit as being competing activities were described by a participant: *“that means both of these things are vying for your attention and your mental energy at the same time and they are in conflict with each other”*. Another participant noted that *“explore and exploit projects are kind of two entities that run alongside each other”*, with another noting that *“if you spend too much time on the one you definitely negatively effect to other, your quality of output is not as great on the other in my opinion”*.

In contrast to this view three of the participants indicated that explore and exploit activities are interrelated and that explore activities inform exploit activities and vice-versa. Thus, reporting that the activities can be combined in a synergistic fashion as described by an example shared by a participant. In the example an exploit activity of physically manufacturing a finished component leading to exploratory act of discovery: *“So sometimes you do it in one way and then only once you start making it and producing it, you realize that there's actually a better way to have done it. So I think the 2 go hand in hand and they need to go ahead and that they can't be separated.”*

As was the case for the temporal dimension, it was also reported that the balance dimension is dependent upon the content of the tasks that could be combined to achieve synergy rather than to view tasks as requiring separate resource allocation. One participant who viewed explore and exploit as mutually exclusive endeavours described how task relatedness can support synergy: *“I think if those two play into each other's fields and they build on one another or ... it's related to some extent and I think that does help”*.

From the preceding a key finding is that the balance dimension is a relevant construct to describe how individual ambidexterity is achieved in practice since both possibilities were manifested in the presented results. It is furthermore evident that it is not a given that the balance dimension view held by product designers would always be stable. The most prominent factor identified that would influence the balance was the relatability of explore and exploit actions.

5.4.3. Categorising respondents according to the proposed topology

Mu et al. (2020) proposed that individual ambidexterity be categorised according to the individual's view of the balance dimension, whether explore and exploit are viewed as incompatible endeavours that has to actively be balanced, or if it is complementary endeavours that are mutually reinforcing, providing synergy and advantages when they are executed in combined fashion, and how the individual achieves ambidexterity with regards to the temporal dimension, i.e. whether they explore and exploit simultaneously or if they switch between the two endeavours in a temporal fashion.

Table 5 below summarises the frequency of each combination that was recorded in this research.

Table 5: Categorisation of research participants according to temporal and balance dimension

		Balance dimension	
		Mutually Exclusive requiring balance	Combined in synergy
Temporal Dimension	Simultaneous	Wire Dancer -	Synergist 3 (A, J, K)
	Sequential switching	Pendulum 7 (B, E, F, G, H, I, L)	Juggler 3 (D, C, M)

Numeric value is the number of participants in the categorisation while the letters indicate which participants

It was initially expected that some constructs may emerge related to specific categories. This however did not materialise in general in this study, in part due to the fact that the small sample did not allow for a feasible spread over the different categories. If larger samples can be achieved in future research this may be possible. In the selected cases where there are indications that the categorisation seems to be relevant it is discussed in the specific section.

5.4.4. Conclusion: Individual ambidexterity topology

Although the sample size is not large enough to attempt any form of validation of the topology the results do seem to indicate relevance of the topology in this context with participants categorised in three of the four possible categories. The sample population can be described as seven pendulums, three synergists and three jugglers. The topology makes it possible to immediately learn something about the individual's approach to individual ambidexterity.

In the next section the reported enablers and inhibitors to individual ambidexterity is presented.

5.5. Results for Research Question 3

Research Question 3: Establish what the factors are that enable and inhibit individual product designers' achievement of individual ambidexterity.

This research question was intended to address the objective of identifying internal and external factors that influence the product designer's view and achievement of ambidexterity. This question is aligned with the call for studies that identify motivational and cognitive factors that influence individual ambidexterity that have not been reported on before (Mom et al., 2018; Pertusa-Ortega et al., 2020), as well as the call for empirical studies that consider specific contextual factors (Mu et al., 2020; Pertusa-Ortega et al., 2020). As reflected in Table 1 in Chapter 4, interview questions 4a & b and 5a & b were included to answer this research question.

A variety of enabling and inhibiting factors were identified by analysing the transcripts of interviews with thirteen product designers who have to achieve ambidextrous outcomes at the individual level in the execution of their daily work. Beyond categorisation as being enabling or inhibiting the factors were categorised as either being internal to the participant, or emanating from an external influence and grouped into primary constructs through thematic analysis. The enabling factors are presented first in section 5.5.1 followed by the presentation of identified inhibiting factors in section 5.5.2.

5.5.1. Factors that enable individual ambidexterity

Interview questions 4a and 4b were included to uncover factors that individual product designers regard as enabling their own individual ambidexterity. Table 6 below shows the primary constructs, categorised according to whether they are regarded as external or internal factors. The cumulative number of participant references that were categorised under the primary construct is also included in the table as an indication of the prominence of the construct in the total dataset. The results are then extended in subsequent sub-sections through a presentation of the secondary supporting constructs, which underpins the primary constructs, and prominent constructs discussed further.

The reported results indicate that a combination of internal and external factors enable individual ambidexterity as reflected in Table 6.

Table 6: Factors that enable individual ambidexterity: Primary constructs according to internal or external categorisation

External/ Internal	Primary construct	Total frequency
External enabling factor	Management and management processes that enable ambidexterity	23
	Provided design tools and resources enable ambidexterity	4
	Team, Peer, Social or organisational interaction factors enable ambidexterity	4
	Task or work content and work environment factors enable ambidexterity	2
	Access to information enables ambidexterity	2
Internal enabling factor	Knowledge, experience and information factors enable ambidexterity	13
	Time management techniques and factors enable ambidexterity	11
	Personal factors enable ambidexterity	11
	Skills, techniques and capabilities enable ambidexterity	4

It is apparent that the 'Management and management processes' construct is the most prominent primary construct in the external factor category, while three constructs which were categorised as internal factors enabling ambidexterity, namely 'Knowledge, experience and information'; 'Time management techniques'; and 'Personal factors', are prominent if one considers the cumulative number of participant observations. As has been noted already each of the primary constructs are supported by secondary constructs from which they were consolidated

5.5.1.1. External Factors that enable individual ambidexterity

Table 7 on the next page presents a consolidation of external factors identified as enabling individual ambidexterity. The secondary constructs that emanated from the thematic analysis of the transcripts of thirteen interviews with non-managerial product designers who work in the earth moving equipment industry which informed these primary groupings of enablers are also presented. The presentation of the results is followed by a short elaboration of the most prominent constructs.

Table 7: External factors that enable individual ambidexterity: Primary and secondary constructs

Primary construct	Secondary construct	Frequency
Management and management processes that enable ambidexterity	High level planning and prioritisation supports individual ambidexterity	5
	Granting designer task- and time management autonomy	5
	Managing the workload of employee to allow time for explore and exploit	4
	Clear and frequent communication of vision, goals and progress towards goals	3
	Matching the task demand to employee capabilities and interests	3
	Engaged and interested manager resolves tension	2
	Being allowed to explore	1
Provided design tools and resources enable ambidexterity	Tools make it easier to combine explore and exploit	2
	Access to additional resources to support tasks	2
Team, Peer, Social or organisational interaction factors enable ambidexterity	Team culture	1
	Peer influence stimulating explore and exploit	1
	Relationships with colleagues who can provide needed resources	1
Task or work content and work environment factors enable ambidexterity	Task relatedness	2
	Pleasant physical work environment	1
	Colleagues who know what needs to be done	1
Access to information enables ambidexterity	Access to fast, reliable sources of relevant information	2

As was the case for the primary constructs the external factors that enable individual ambidexterity that were mentioned by the most participants relate to specific influences managers and management processes exert on individual work. The most prominent secondary constructs are reported on in more detail below.

5.5.1.1.1. Management and management processes that enable ambidexterity

In structural ambidexterity the ambidextrous tension is said to be resolved at the management level (O'Reilly & Tushman, 2004), amplifying the role management play in resolving the explore and exploit dilemma. In contextual ambidexterity which is the theoretical basis for individual ambidexterity it is posited that this tension pervades the organisation and that it would be up to every employee to resolve this tension (Gibson & Birkinshaw, 2004). The variety and high prevalence of references to management factors that enable individual ambidexterity is thus noteworthy, given the different views in the literature about where the ambidextrous tension is resolved. Two secondary constructs that relate to management and management process influence were identified by five participants as enabling their individual ambidexterity, which was also the highest frequency of any of the enabling factors. The first of one listed is the fact that management play a role in high level planning and setting priorities as identified by five participants.

High level planning and prioritisation

It was reported that managers support individual contributors with guidance on high level planning and prioritisation. Explaining how unexpected demands disrupt their planning one participant reflected on the role their manager plays to resolve the associated tension: *"that obviously throws a curveball in your time management that you had in the beginning of the week, but certain other of the tasks between [Manager] and myself will typically sit there ... and between the two of us will get to sort of a middle ground and build a list like that with the different priorities and time management that you sort of allocate to the different tasks."*

Another participant proclaimed the importance of management undertaking the planning of work, and providing guidance in prioritising individual tasks in design projects that require multiple team members' input, while at the same time exploring and exploiting. They likened the task to eating an elephant: *"but if the work is planned upfront properly and the timing of the work that's coming your way is planned, then*

it's much easier to eat the elephant bit by bit, ... if everything is given to you chunk by chunk and say "the project we're starting at the trunk of this project and we're going to eat it, past the trunk, then the head" then going about it in detail and everybody is working in that direction. Your manager has got to give that direction of how you're going to eat this elephant together with the rest of the team".

Granting task- and time management autonomy

Task and time management autonomy was also identified as an influential factor by five of the participants. Granting of autonomy over time and tasks is a management prerogative. For this reason, it is categorised under the management influence primary construct as confirmed by a participant: *"I would say it come from management so to give you free will basically to make your own choices on how to manage your own time between different projects and different demands from wherever".*

It is interesting to note that only one of the five participants who identified high level planning and prioritisation as influential also identified task and time management autonomy as an enabling factor. In recognising their manager's role in achieving ambidexterity one participant said: *"I'm also blessed to be working for who I consider a very good manager, because he pretty much leaves us to our own devices and doesn't interfere when it's not necessary".* Another participant noted that task and time autonomy enabled freedom to do more exploration *"I enjoy more freedom and by having a sort of freedom and not micromanage, I don't feel that I need to have deliverables everyday.... So I'm able to work on a lot more exploratory things in detail".*

Managing the workload of employee to allow time for explore and exploit

If a balance has to be struck between explore and exploit to achieve both outcomes, as viewed by wire dancer and pendulum profiles in the individual ambidexterity typology, it is important that management allocated adequate resources, as is indicated in this third highest ranking management, and external enabler secondary construct. As one participant explained *"the most effective way to do it would be to have the resources of the time resource being allocated to you being reasonable for projects and the amount of projects, that you've got to jump between, limited."*

Matching the task demand to employee capabilities and interests

Beyond managing the workload of employees, three participants reported that when managers match task content to employees' capabilities and interests it aids in achieving individual ambidexterity. One participant captured the essence of the construct in stating that their manager has *"got to filter to the work down to you for your abilities for your most productive way of doing your work"* when asked about things that enable their own individual ambidexterity.

Clear and frequent communication of vision, goals and progress towards goals

Three participants stressed the importance of clear vision and objectives in achieving successful ambidexterity. Two of these explained how important clear goals and vision are when the opportunity arises to explore new possibilities: *"Having a goal, having a vision, and knowing what would be to the benefit of product's going out the door, or dealing with existing limitations and having a vision of how those could be dealt with, and if you've got a vision, you also have a direction in which exploration can go. If you didn't have a vision, you wouldn't know what to explore, you'd explore everything and you wouldn't even know when you find something useful that it is useful"*. While another participant explained how clear goals and vision helps them to break down the tasks which seem to be in conflict to actionable items: *"I need to know where do you want me to go where the goal posts, show me the goal post and I'll go through everything in between. I'll figure out what needs to be done in between"*.

Conclusion of external factors that enable individual ambidexterity

The results indicate the important role that external factors play in enabling role in achieving individual ambidexterity. The most prominent external factor that was identified by the interview participants is the role management plays, specifically in setting the tone and general direction and coordination of individual effort. Management is further also instrumental in ensuring that there is adequate time allocated for both explore and exploit activities, while empowering the individual contributors to take ownership of their time allocation. Other external factors that were identified as enabling individual ambidexterity, albeit at a less prominent level include the 'provided tools and equipment'; 'team members and colleagues'; 'specific

task content'; and 'access to information'. In the next section the internal factors that enable individual ambidexterity is discussed.

5.5.1.2. Internal factors that enable individual ambidexterity

Table 8 on the next page presents a consolidation of internal factors identified as enabling individual ambidexterity. The secondary constructs that emanated from the thematic analysis which informed these primary groupings of enablers are presented alongside the primary constructs already shown. The presentation of the results is followed by a short discussion of the most prominent constructs.

Table 8: Internal factors that enable individual ambidexterity: Primary and secondary constructs

Primary construct	Secondary construct	Frequency
Knowledge, experience and information factors enable ambidexterity	Experience guides prioritisation of own explore and exploit activities	4
	Understanding the impact of decisions on others	4
	Knowing when good is good enough	2
	Spending time operating/using similar products	2
	Having broad and varied background and experience	1
Time management techniques and factors enable ambidexterity	Matching the cognitive cycle to specific tasks	4
	Breaking assignments down to bite size chunks	3
	Doing less preferred work (exploit) first to focus on preferred work (explore)	2
	Learn how to suppress explore preference to do exploit when needed	1
	Planning work	1
Skills, techniques and capabilities enable ambidexterity	Influencing and persuasion skills and tactics	3
	Social skills	1
Personal factors enable ambidexterity	Ability to handle pressure	3
	High motivation levels	2
	Ability to switch between tasks	2
	Being goal oriented	2
	Healthy dose of curiosity	1

A variety of internal factors enabling individual ambidexterity in product designers were identified. In the combined highest ranking three constructs were identified in four of the interviews with two of these being categorised as relating to ‘Knowledge, experience and information factors’, while a number of constructs were identified by three participants. The most prominent constructs are discussed in more detail in the next sub-section.

5.5.1.2.1. Knowledge, experience and information factors that enable ambidexterity

The primary construct with the highest overall frequency count is 'Knowledge, experience and information factors that enable ambidexterity' while the two highest ranked secondary constructs, that describe factors that enable individual ambidexterity, were categorised under this construct.

Experience guides prioritisation of own explore and exploit activities

Four participants identified how they rely on past experience to guide their own prioritisation efforts, with experience being combined with other constructs like time management and understanding how decisions impact other functions. One designer emphasized the importance of experience in response to a question about how they determine whether a refinement request from the production team is urgent or a nice to have: *"It is only through experience that you get to know that"*. While another respondent explained how they rely on experience in setting priorities as part of their time management approach: *"I try and sort of fall back on I would say the experience that I've acquired up until now, that certain tasks you can look at it and you can sort of gauge and say there's quite a lot of design work"*.

Understanding the impact of decisions on others

Product design choices have implications for all functions that touch the product in the course of their work. These include the factory that manufactures the product, purchasing teams who purchase material inputs and parts to the manufacturing processes as well as the marketing and sales team who promote the end product to the customer. Four participants reported that having a sound understanding of the influence their choices have on others enables their own ambidexterity. An example of the influence such an understanding has is an explanation offered about how designs derived out of ambidexterity are different to a simplistic design approach of either explore or exploit: *"You actually come up with an idea, and sometimes you mould it that you know downstream it is going to be possible that it actually gets implemented... if you understand the downstream exploit part of things it does, in my opinion, help you to come up with a possible better future idea"*.

An understanding of the impact on others is not limited to the product and its touchpoints in the organisation, but also to how the individual experiences the ambidextrous tension with one participant designer explaining that understanding the influence of what they do motivates them to perform the less favoured tasks: *“if I understand what the implications of what I'm doing, I can do a very seemingly unimportant task and I can do it well because the context is important for me”*.

5.5.1.2.2. Own time management enables Individual ambidexterity

In a construct that relates to management allowing employees time management autonomy, it was noted that actually performing their own time management effectively also enables individual ambidexterity.

Matching the cognitive cycle to specific tasks

Four participants indicated that in their time management choices they deliberately match their cognitive cycle to either explore or exploit. Two participants noted that when the opportune moment arrives to be creative this should be harnessed. They reported to then focus on exploration, with an example of this phenomena captured by this explanation: *“if I am in the mood for new product development and I feel the creative juices flowing, then obviously I'm going to try and focus my time on that”*.

In an alternative approach, other participants noted that there is a rhythm that they try to maintain to reserve the time when they are most effective for the most taxing task. This is evident from this explanation: *“I think it you're most effective early, as early in the morning, so I tried to do the hard graft, the creative conceptual stuff earlier in the morning”*.

Breaking assignments down to bite size chunks

Task autonomy was also identified as an aspect that is controlled by management and enables individual ambidexterity. As before having the opportunity to manage oneself is only part of the enabling mechanism. The next most prominent construct, reported by three participants, relates to how employees manage their tasks to achieve ambidexterity, specifically to break down the work into executable chunks. One of the participants explained that this helps them to resolve the tension of explore versus exploit, as they rather approach all activities in a task driven manner: *“I'm trying to get a single way of approaching all these projects and my single way of*

doing it is tell me where you want to go and I'll make you a list of how I think I'm gonna get there, and I think that's my approach on most of these projects". While another participant identified using checklists as an effective way to keep track of the unfavoured procedural tasks: "it definitely helps to have a set routine set schedule to go through it, maybe a checklist to see if I covered all the bases".

Influencing and persuasion skills and tactics

Though colleagues and peers can act as external enablers of individual ambidexterity it was also noted that the ability to influence these helps. Three participants identified that influencing and persuasion skills enables ambidexterity in situations where designs borne out of an ambidextrous approach require more alignment than would be the case with a one-dimensional approach. It is also mentioned as a factor to the inhibitor that a lack of shared goals and visions inhibit individual ambidexterity, as captured by this description offered by a participant: "I think it's a skill to get people to move in the same direction as you. I think it's something that you learn with time".

Motivation and ability to handle pressure:

Internal orientations and characteristics were also reported to enable individual ambidexterity. Two such constructs that are closely related is the 'ability to handle pressure', or alternatively stress-tolerance, and having 'high motivation levels'. The constructs are deemed to be related since being able to tolerate stress relates closely to motivation. Motivation is defined as "the force that energises behaviour, gives direction to behaviour, and underlies the tendency to persist, even in the face of obstacles" (Wärnich, Carrell, Elbert, & Hatfield, 2018, p. 253).

A participant summed up the 2 constructs, that relate to how the ability to handle pressure and having the motivation to persevere through times of pressure, well with this explanation of factors that enable ambidexterity: "it's also important to be able to take a bit of stress...and the situation that you're in probably is going to vary, and your ability to solve that issue will also play into that stress levels and I think internal motivation and some of those other factors are just the way you approach life rather than just necessarily work".

Conclusion of internal factors the enable ambidexterity

The results indicate that a variety of internal factors act as enablers to individual ambidexterity. A number of the factors act in combination with the external factors to enable ambidexterity. An example of this is the autonomy to time manage own time which has to be combined with the ability to time manage, and in the process individual ambidexterity is enabled. There are also factors that were identified as enabling individual ambidexterity that weren't related to other factors. These are the ability to handle pressure, and high levels of motivation.

Besides factors that enable individual ambidexterity Research Question 3 also sought to identify factors that inhibit individual ambidexterity. The factors identified as inhibiting individual ambidexterity are discussed in the next sub section.

5.5.2. Factors that inhibit individual ambidexterity

Interview questions 5a and 5b were included to uncover factors that individual product designers regard as inhibiting their own individual ambidexterity. The overarching primary constructs identified as inhibiting individual ambidexterity are shown in Table 9 on the next page. Keeping the same convention as was followed in the presentation of enabling factors the primary constructs were categorised as internal or external, while the total number of respondents who made reference to secondary constructs were added together to arrive at the total frequency that is reported. This allows for weighting of the most influential primary constructs.

Table 9: Constructs identified describing product designers' view of factors that inhibit individual ambidexterity

External/ Internal	Primary construct	Total frequency
External	Management and management processes that inhibit ambidexterity	22
	Task or work content and work environment factors inhibit ambidexterity	8
	Team, Peer, Social or organisational interaction factors inhibit ambidexterity	6
Internal	Knowledge, experience and information factors inhibit ambidexterity	6
	Personal factors inhibit ambidexterity	3
	Skills, techniques and capabilities inhibit ambidexterity	1

The reported results indicate that a combination of internal and external factors act as inhibitors to individual ambidexterity. It is apparent that, as for the enablers, the 'Management and management processes' construct is the most prominent primary construct in the external factor category. Additionally, three constructs 'Knowledge, experience and information'; 'Time management techniques'; and 'Personal factors', which were categorised as internal factors enabling ambidexterity, are prominent if one considers the cumulative number of participant observations. As has been noted already, each of the primary constructs are supported by secondary constructs from which they were consolidated.

5.5.2.1. External Factors that inhibit individual ambidexterity

Table 10 on the next page presents a consolidation of external factors identified as inhibiting individual ambidexterity. The secondary constructs which underpin these primary groupings of enablers are also presented. The presentation of the results is followed by a short elaboration and discussion of the most prominent constructs.

Table 10: External factors that inhibit individual ambidexterity: Primary and secondary constructs

Primary construct	Secondary construct	Frequency
Management and management processes inhibit ambidexterity	Multiple demands on available time or too little time allocation inhibit ambidexterity	9
	Inefficient or overly complicated work processes inhibit ambidexterity	3
	Veto decisions inhibit ambidexterity	3
	Skewed priorities inhibit ambidexterity	3
	Too much pressure leads to more difficult switching inhibiting ambidexterity	2
	Changing vision, goals and direction inhibits ambidexterity through reduced motivation	1
	Micro management inhibits ambidexterity	1
Task or work content and work environment inhibit ambidexterity	Constraints imposed by existing products and capabilities inhibit ambidexterity	7
	Mundane task demands inhibit ambidexterity	1
Team, Peer, Social or organisational interaction factors inhibit ambidexterity	Siloism and lack of shared vision and goals in other teams inhibit ambidexterity	2
	Cross functional integration demands inhibit ambidexterity	2
	Untimely inquiry from peers inhibits ambidexterity	1
	Working remotely or in isolation inhibits ambidexterity	1

As was the case for the primary constructs, the external factors that inhibit individual ambidexterity that were mentioned most frequently by participants relate to specific influences managers and management processes exert on individual work. Beyond management the next most influential inhibiting factor identified relates to the constraints imposed by existing designs and capabilities under the primary construct that deals with task and work content and work environment factors. The most prominent secondary constructs are reported on in more detail below.

5.5.2.1.1. Management and management processes inhibit ambidexterity

Nine participants made mention of inhibiting factors that are categorised under the construct multiple demands on available time or too little time allocation inhibit individual ambidexterity. Just like having sufficient time allocated to explore and exploit was identified as an enabler, too little time acts as an inhibitor, with five participants reporting that if there is too little time, they only perform the exploit portion of their work. One of the participants described: it as *“the more pressure one is under, external pressure ... the more I would go into a refinement mode. And I just get the work out. Just get the work done mode”*, with another noting that *“it’s the portion of the mix of exploration and exploitation that may be adversely affected. Um, just because there’s less time to one day”*, and as reported in 5.3.3 multiple participants reported that exploit enjoys priority and for this reason it is the explore portion that is sacrificed when time is scarce.

Multiple demands on available time also inhibits ambidexterity as one participant explained how they experience the demands to regularly switch between explore and exploit modes: *“I feel that that is sometimes definitely an inhibiting factor because it kind of mentally gets to you because ... the work starts piling up, so it’s piles on the stress values, but it also is every time before when there’s a million things to think of, and you want to approach each one of those focused, then it’s quite difficult to swap between those different boxes”*.

Another management process factor relates to work processes, with 3 participants reporting that inefficient or overly complicated work processes inhibit their ambidexterity. One participant described the scenario as spanning across the organisation: *“we have almost little silos and each department comes up with a with a flow diagram or a process that suits themselves. You know very few times it’s to*

support the actual end user” and offering an example close to home: “the drawing sign off process, I mean that whole function is to support engineering, yet engineering has to end up walking things through and going through a whole bunch of legwork for a for a function that’s largely there to support us”. In the end process inefficiencies lead to time tax and frustration which inhibits ambidexterity. Beyond management processes decision making also influence ambidexterity.

Three participants noted that higher level decision makers (i.e. management) can inhibit ambidexterity with veto decisions. As one participant explained: *”you get sometime persons that will disagree with what you want to do or, and they’ve got their way of doing it, so someone that blocks your way of what you have to do and then you’ve either have to prove to them that they’re wrong or you just have to do what they do”*, with another adding a view to office power plays and politics to it: *“reviewers have put their sort of ego or the politics within the company first..., so that inhibits it”*.

5.5.2.1.2. Task or work content and work environment inhibit ambidexterity

In contrast to the primary construct that ‘Task or work content and work environment’ can act as an enabler to individual ambidexterity, as shown in Table 10 two secondary constructs were identified in the same category that inhibits ambidexterity. The most prominent secondary construct, which is discussed below, relates to the fact that the design work often relates to existing designs and utilising existing processes and capabilities to achieve the intended design, was identified as inhibiting ambidexterity by seven participants.

Constraints imposed by existing products and capabilities inhibit ambidexterity

A participant described the fact that due to system level complexities solutions have to be sought within existing bounds and that it influences the overall individual philosophy, limiting the novelty of solutions and favouring refinement: *” your mindset would sort of be like OK get the best solution that’s workable that you could integrate into the current system”*. While another participant isolated the fact that current organisational capabilities limit the extent to which alternatives can be explored, before refining these: *” sometimes the best methods are not what*

production can do, so you have to be very flexible on what they can do, and you have to change your designs”.

5.5.2.1.3. Team, Peer, Social or organisational interaction factors that inhibit ambidexterity

In contrast to the reported observation that team mates and peers can enable ambidexterity, six of the interview participants identified team, peer and social aspects of work that were deemed to be inhibiting ambidexterity. The most prominent constructs that were included for further discussion relates to how siloism and a lack of shared vision and goals in other teams and cross functional integration demands inhibit ambidexterity.

Siloism and lack of shared vision and goals in other teams inhibit ambidexterity

Two of the participants described how siloism and a lack of shared vision and goals in other teams place additional demands on them to drive change management and ultimately they deem this to be inhibiting to their own endeavours to explore and exploit as iterated frustratedly by a participant:” *the urgency doesn't get carried over. The only way I can get it carried over is by checking up on them ... The urgency doesn't get carried over, and I think you can't solve that... The bigger your company is, people's processes aren't aligned and the urgencies are not on the same things.”*

Cross functional integration demands inhibit ambidexterity

In a construct that is related to lack of alignment between teams two of the participants explained that the integration demands to achieve cross functional alignment in the implementation of new designs are inhibiting to their own ambidexterity. One of the participants captured the essence of this construct well with the following explaining the mechanism:” *the more people are involved in a process, and by definition the exploitative part of the process does involve more people, the opportunity for this thing to take long and to be difficult to follow through and to make reach its end point is a lot harder than the exploration part”.*

5.5.2.2. Internal factors that inhibit individual ambidexterity

Table 11 below presents a consolidation of internal factors identified as inhibiting individual ambidexterity. The secondary constructs that emanated from the thematic analysis of the transcripts, of thirteen interviews with non-managerial product designers who work in the earth moving equipment industry which informed these primary groupings of enablers are presented alongside the primary constructs already presented above. The presentation of the results is followed by a short discussion of the most prominent constructs.

Table 11: Internal factors that inhibit individual ambidexterity: Primary and secondary constructs

Primary construct	Secondary construct	Frequency
Knowledge, experience and information factors inhibit ambidexterity	Lack of specific knowledge or experience inhibits ambidexterity	4
	Lack of understanding where responsibilities start and end inhibits ambidexterity	2
Skills, techniques and capabilities inhibit ambidexterity	Having too many refinement tools and knowledge constrains free thinking and inhibits individual ambidexterity	1
Personal factors that inhibit ambidexterity	Lack of motivation inhibits individual ambidexterity	2
	Introverted personality inhibits individual ambidexterity	1

A variety of internal factors that inhibits individual ambidexterity in product designers were identified. The most prominent constructs are now discussed in more detail.

Lacking specific knowledge or experience was identified as a prominent internal factor inhibiting individual ambidexterity with four of the interview participants isolating these factors as influential in ambidexterity. As one of them explained from a general perspective: *“I have a relatively good general knowledge, but there are*

definitely areas that stop me from doing refinement work, or exploring conceptual ideas just because I don't have the mental tools", with another participant noting how unfamiliarity with an knowledge area is experienced as an inhibitor due to the time pressure it brings: "doing unknown exploratory work is, yeah, in my recent past it was the pressure to do unknown, or the pressure that let's say the time pressures that I had to get unknown exploratory work done. That was ... my biggest hurdle in the past".

Lack of understanding where responsibilities start and end inhibits ambidexterity

In a construct that relates to inefficient processes and how these inhibit individual ambidexterity two participants noted that their own lack of sense for where their responsibilities start and end inhibits their ambidexterity by making complicated changes more difficult to implement. As captured by one of the participants: " *It would be nice if specific boundaries are set that you know you are responsible for certain tasks, and once you've completed them, you can move you can move on to the sort of next item on your list, whether it be in the exploratory or the exploit"*

Lack of motivation

Two participants identified a lack of motivation as inhibiting to their individual ambidexterity. One of the participants explained that a lack of motivation would lead to them doing that which has to be done, in their case the exploit part of the work: " *the exploiting part would still carry on to a certain extent but for me, you know personally, the exploring side of my brain, would just be non-existent when that happens, or when it happened."*

This underscores the importance of motivation with motivation being identified as an enabler, but also that a lack of motivation can be and inhibitor.

5.5.3. Conclusion to factors that enable and inhibit individual ambidexterity

It can be concluded that there are multiple enablers and inhibitors to individual ambidexterity. A combination of factors that emanate from within individual and that is manifested externally to the individuals were reported on. Many enablers and inhibitors are related and could work in a mutually reinforcing manner. One such an

example is the external enabler time management autonomy that will be reinforced when it is combined with time management ability that was identified as an internal enabler. It is apparent that management are key actors with the ability to enable or inhibit individual ambidexterity in their team members. Beyond management the broader organisational setting including team, peer and social interaction factors and the task, work content and working environment were also identified as having the potential to enable or inhibit individual ambidexterity.

From an internal perspective individual capabilities and orientations were reported as being key in achieving individual ambidexterity. Time management techniques were reported as being an enabler. Additionally, some individual aspects were reported that can both enable or inhibit ambidexterity. The most prominent being related to knowledge, motivation and the ability to work under pressure. In the next section the outcomes of individual ambidexterity are discussed.

5.6. Results for Research Question 4

Research Question 4: Establish what the perceived benefits and perceived negative outcomes are of achieving individual ambidexterity.

This research question sought to address the objective of identifying the outcomes of individual ambidexterity at the individual level. Both Mu et al. (2020) and Pertusa-Ortega et al. (2020) noted that positive outcomes of individual ambidexterity have been reported on in some studies, but that very few studies reported on negative outcomes of ambidexterity proposing that future research also consider negative outcomes. In response Research Question 4 focused on both positive and negative outcomes of individual ambidexterity in this homogenous contextual. Interview questions 6a 6b and 7 were included in the semi-structured interview guide to answer this research question.

A variety of outcomes were identified through the thematic analysis of the thirteen semi-structured interview transcripts. The identified outcomes were categorised according to the perceived nature of the outcome, be it positive or negative, as well as the location of the impact relative to the individual. An internal impact is one that

influences the individual directly, while outcomes that affect the external environment or other people were categorised as external impacts.

5.6.1. Outcomes of individual ambidexterity

Table 12 shows the primary constructs that were identified by categorising the outcomes of individual ambidexterity that was reported by the interview participants. The total number of participants that reported outcomes that relate to the construct is also reflected along with an indication of whether the outcomes are negative or positive.

Table 12: Outcomes of individual ambidexterity

External/ Internal	Primary construct	Total frequency
External	Team members or colleagues benefits from ambidextrous design work	3+
	Ambidextrous design work influences efficiency and performance	11+ 6-
Internal	Ambidextrous design work broadens knowledge and perspective	11+
	Social or cross functional integration demands	9-
	Ambidextrous design work influences motivation and job satisfaction	20+ 9-
	Ambidextrous design work impacts on how tasks are viewed and approached	1+ 9-
	Ambidextrous design work has stress related impact	1+ 9-
	Ambidextrous design work influences personal development	3+

5.6.1.1. External outcomes of individual ambidexterity

Table 13 shows the already noted primary constructs of external outcomes of ambidexterity along with more detailed secondary constructs and in indication if the outcome is a positive (+) or negative (-) outcome. The table is followed by in depth discussion of the most prominent constructs.

Table 13: External outcomes of individual ambidexterity

Primary construct	Secondary construct	Frequency	+/-
Team members or colleagues benefit from ambidextrous design work	Ambidextrous design work makes someone else's work easier or better	3	+
Ambidextrous design work influences efficiency and performance	Ambidextrous design work leads to improved designs	9	+
	Ambidextrous design work leads design that are not as good as they can be	1	-
	Ambidextrous design work leads to improved efficiency	2	+
	Ambidextrous design work leads to lower performance or efficiency	5	-
	Ambidextrous design work leads to some work being discarded	3	-

5.6.1.1.1. Team members benefit from ambidextrous design work

Making someone else's work easier or better. As described by a participant *"it's rewarding to get a new product out and is nice to see your parts that you, something that you've refined, the people are working easier, it's making somebody's life better"* One participant explained that if exploration and exploitation is not combined it is very likely that novel ideas will have negative downstream impacts, but when they are combined: *"the production guys come to you after first manufacturing the first product and say "Well done", they love the way you packed the things together and place them together for them it makes your life so much easier and they can work faster now"*

5.6.1.1.2. Ambidextrous work influences efficiency and performance

The constructs that relate to performance and efficiency was identified as an outcome with an external impact since the spoils of the gain is mostly for the organisation to reap. A similar but different impact on the internal side is the impact to employee motivation which is covered separately. Two participants explained that they believe individual ambidexterity in design leads to improved efficiency, as captured by one: *"I think then at that stage you basically gain time for if you were just to explore the whole entire machine after you're done, then you do the small checks, then you have to get into the mindset of the way you were thinking when you designed the specific thing, I think that could cause a delay"*.

In contrast five pendulums noted that they experience lower performance and efficiency due to the demands to be ambidextrous. The loss of efficiency was ascribed to switching costs incurred when participants switch between explore and exploit, with a central idea being that if one were able to focus solely on explore or exploit, rather than to combine and switch between these it would lead to improved efficiency. This idea was explained nicely in context by one of the participants: *"with a task you dig in and you sort of have all the different issues to do with executing the task in your head, ..., to swap over to doing something else now got to fold up all these things, ... and take this new thing and then you have to try and remember "where were we with this?" ... So, it's not always possible to just ... stop this one thing and start the other thing immediately because there's a transition"*.

In a construct that is related to lower efficiency 3 participants indicated that an outcome of approaching designs in an ambidextrous manner is that *"you sometimes eliminate some of the exploring that you did. Because ... it's invalidated by your exploitation of the concepts"*.

Impact on the quality of designs: In total nine participants reported that better designs was an outcome of ambidextrous design. Seven participants viewed explore and exploit as activities that compete for the same resources, yet all seven are among the nine respondents who noted that when individual ambidexterity is achieved in design better designs are generated as an outcome. In order to maintain

a consistent level of abstraction a number of key ideas were combined under the secondary construct of improved designs being an outcome of individual ambidexterity

Task variety that is an effect of ambidexterity was described by a participant as helping them to achieve better designs by changing contexts:” *often once you’ve worked on other problems and you come up with other solutions and you look at different areas suddenly when you look at the problem that you were initially faced with, you’re able to see it in a whole different light. So no, I think it’s better to be able to switch between the two.*”

The juxtaposition of explore and exploit being regarded as conflicting mutually exclusive events from a balance perspective while at the same time leading to improved designs was described by a number of participants. One designer who describes explore and exploit as “*two jealous sibling birds in the same nest. The one is always trying to kick the other one out*” in terms of how they compete for resources, also noted that explore and exploit leads to better designs:” *what you do when you’re designing a new product obviously makes you more able to improve an existing thing, and vice versa what you learn during improving the existing thing makes you a better designer of a new product*”. Another designer commented along the same lines that:” *if you just dabble in exploration then sometimes your practical experience lags behind. So the fact that you can that you can get the here and now results from something that happened some time ago ... that changes how you then approach your exploration side, so that that I would say is an advantage.*” While at the same time sustaining their position that it remains competing aspects:” *The negative thing is always then again being able to juggle the two in terms of time and priority.*

Remaining with how designs are improved by exploring novel possibilities, while at the same time refining possibilities for implementation, a prominent observation by six of the thirteen participants was that it leads to better design through the mechanism that the eventual designs are better suited to the organisation’s capabilities. The key thought was captured well by a participant who is openly opposed to individual ambidexterity noted that the “*only positive in this ambidexterity is that you understand the whole process, so if you understand the whole process from beginning to end, then you start off differently.... being involved in exploiting of,*

or the exploitation realm helps you to make less big errors, or conceptual areas, I would say during the exploration”.

Designs that aren’t as good as they can be: In contrast to the above noted positive influence ambidexterity has on the design one participant felt strongly that facing ambidextrous demands led to suboptimal designs due to the constant resource tug of war that rages:” *my direct answer would be I don't believe that your design is as good as it can be because we are splitting ourselves between two worlds.*”

5.6.1.2. Internal outcomes of individual ambidexterity

To support readability of the report the internal outcomes of individual ambidexterity were broken down into separate tables. As before the primary constructs of internal outcomes, reflected in Table 12 are presented along with more detailed secondary constructs and an indication if the outcome is a positive (+) or negative (-) outcome. In each case the table is followed by in-depth discussion of the most prominent constructs.

5.6.1.2.1. Ambidextrous work broadens knowledge and perspective

Table 14 below shows the knowledge outcomes of individual ambidexterity.

Table 14: Knowledge outcomes of Individual Ambidexterity

Primary construct	Secondary construct	Frequency	+/-
Ambidextrous design work broadens knowledge and perspective	Ambidextrous design work broadens design knowledge in general	9	+
	Ambidextrous design work creates opportunity to learn from others	2	+

Nine participants made statements that individual ambidexterity and thus being exposed to explore and exploit demands, broadens their knowledge and experience by working on a wider array of topics than would be the case if they were to focus on either. This construct was captured effectively by one of the participants’ explanation that being involved in the exploration of new designs and the refinement of existing designs that it *“forces you to expose yourself to more different designs and problems*

and solutions than you would normally have been exposed if you just been doing new product development. So it enriches your knowledge.”

Learning from others: The demands for social interaction and integration of ideas that is an outcome of ambidexterity also influences learning, described as a positive outcome by one of the participants:” *so dealing with those folks on a social level interacting with him, and heaven forbid very often learning stuff from them that they say “actually why don't you consider doing this and not that?” ... it's a nice part of the job to be able to get to know them and learn from them”.*

5.6.1.2.2. Ambidextrous work demands integration

Table 15: Social and cross functional outcomes of Individual Ambidexterity

Primary construct	Secondary construct	Frequency	+/-
Ambidextrous design work demands social or cross functional integration	Ambidextrous design work demands social or cross functional integration	6	-
	Ambidextrous design work demands tolerating diversity to achieve cohesiveness	2	-

Besides learning from others there are also other outcomes that are more directly related to social or team integration demands. These demands are however not always positive as described in the discussion on how the integration demand present learning opportunities, with the same participant describing how explore and exploit place different integration demands on designers: *“by definition the exploitative part of the process does involve more people, the opportunity for this thing to take long and to be difficult to follow through and to make reach its end point is a lot harder than the exploration part, which pretty much is a self-contained activity that happens in a very small group of people”.* Another participant described how the integration demands influence their prioritisation:” *I don't have the luxury of doing it whenever I want, people are waiting for me to do things”.*

In a different form of integration demands three participants described that it is often times necessary to tolerate diversity in order to maintain cohesiveness on cross functional teams involved in ambidextrous design projects. This outcome is linked to

the inhibitor construct that cross functional integration demands inhibit ambidexterity. The core idea of this construct is summed up by this explanation from a participant:” *with people, that is very opinionated or pretty strong, they've got a strong opinion that their designs are correct and they never make mistakes, they are correct and everybody else must follow my design and it takes time to persuade them to do something different that might be better for the whole product. Their system might be completely right and perfect, but you've got to do a compromise between his perfect design, and something that's a little bit worse to get the whole system to be better.*

5.6.1.2.3. Ambidextrous work influences job satisfaction and motivation

Table 16: Job satisfaction and motivation outcomes of Individual Ambidexterity

Primary construct	Secondary construct	Frequency	+/-
Ambidextrous design work influences job satisfaction and motivation	Ambidextrous design work is rewarding work and increases job satisfaction and motivation	10	+
	Ambidextrous design work reduces job satisfaction and motivation due to the demand to do less favoured tasks	4	-
	Ambidextrous design work brings task variety and keeps work interesting	4	+
	Ambidextrous design work is satisfying due to ability to implement change and solve problems	4	+
	Ambidextrous design work reduces job satisfaction due to negative performance impact	3	-
	Ambidextrous design work allows designer to reach full potential	1	+
	Ambidextrous design work instils confidence in own work	1	+

Since the objective of this research question was to identify outcomes of achieving individual ambidexterity in product design. Job satisfaction and motivational outcomes were combined as a construct since a number of participants mentioned rewarding work, job satisfaction and terms related to motivation like *“it keeps me going”* together when asked about the positive outcomes of exploring and exploiting at the same time. Alternatively, other respondents mentioned that doing tasks they favour less and which leads to lower job satisfaction (exploitative tasks) *“does not motivate me at all”* and *“temper your spirit”*.

Ambidextrous design work is rewarding work and increases job satisfaction

The most prominent construct that relates to motivation and job satisfaction related outcomes is the secondary construct that ambidextrous design work is rewarding work and increases job satisfaction, which was referenced to ten out of thirteen participants. The underlying idea being that in order to complete a design cycle and actually yield a successful product it is necessary to both explore and explore to achieve a refined product that was borne out of a novel exploratory idea. This was summed up by one of the participants: *“it's from the concept stage into, I mean, the whole exploration finding out how what you want, what the customer wants, what's how you can do something. Into the exploitation, where you, we make all the drawings ... see it come to life in the fabrication and it gets assembled and then finally, this this project that was in your mind or that you pencilled in has now come to life”*.

Ambidextrous design work reduces job satisfaction and motivation due to the demand to do less favoured tasks

Ambidextrous design work was however not viewed as only contributing positively to job satisfaction and motivation by all of the participants. The fact that there was a tendency among participants to favour exploratory work means that to also perform exploit related work was reported to take away some of the work enjoyment by four participants. One participant going as far as noting that they would avoid exploit work if they could: *“this doesn't motivate me at all [exploit work] I don't want to do them honestly if I can avoid them, I would”*, with another noting that exploit work takes enjoyability out of their work: *“it's actually about how much you enjoy going to work and it's directly related to happiness, directly. It's been for me 100% related to happiness. ... I'm much more fond of the exploring part the days that I knew I would*

be exploring I was very happy to go to work. It would feel good, you know, I would feel, in my heart I would feel happy. And the days that I knew would involve a lot of the other stuff you know you sort of drag your feet”.

Ambidextrous design work brings task variety and keeps work interesting

In contrast to the negative view that ambidexterity brings about unfavoured tasks take away job satisfaction, the task variety brought about by ambidexterity was also identified as a positive outcome by 4 participants, in an outcome related to the task variety outcome which improves efficiency. It was noted that it keeps work interesting. This task variety positive impact was described by a participant that having both explore and exploit work to do *“break the monotony of exploitative tasks, having some exploration tasks thrown in, you know, just makes your day a little bit better.”*

Ambidextrous design work is satisfying due to ability to implement change and solve problems

Four participants identified with the construct that individual ambidexterity brings satisfaction by implementing change and solving problems. Although these elements aren't unique to ambidexterity and problem solving it is particularly relevant to ambidexterity in design. By combining explore and exploit, the design process that starts with exploring possibilities is concluded by refining the chosen solutions to eventually solve the original problems. This concept is described by one of the participants *“you come up with a new idea, you can actually take it from a concept phase, put it into reality, followed through the entire process and actually see that it's one day implemented onto a truck and it's implemented and it actually works”.*

5.6.1.2.4. Ambidextrous work impacts on how tasks are viewed

Table 17: Task related outcomes of Individual Ambidexterity

Primary construct	Secondary construct	Frequency	+/-
Ambidextrous design work impacts on how tasks are viewed and approached	Ambidextrous design work brings a need for time management	6	-
	Ambidextrous solutions require more selling	2	-
	Ambidextrous design work makes design activity more challenging	1	-
	Ambidextrous design work makes future design work easier	1	+

Beyond job satisfaction and motivation achieving individual ambidexterity also has implications for how tasks are experienced and received by the product designers who were interviewed. The most prominent construct in this regard relates to one of the most prominent enablers: Time management.

Ambidextrous design work brings a need for time management

In a construct that relates to how participants approach their allocated work six participants noted that the need to achieve good time management is an outcome of individual ambidexterity. This was especially prominent among four pendulums who view explore and exploit as vying for the same resources. The essence of this construct was captured by one participant noting that: *“if you spend too much time on exploring, which is the nice task ... which I think most engineers are driven to because you want to understand, you want to learn new things, we've only got a set amount of time per week ... so I think if you spend too much time on the one it will definitely affect the quality that you might produce on the other.”*

Ambidextrous solutions require more selling

Two participants noted that since exploration adds novelty to solutions, those solutions that are born out of individual ambidexterity require more internal selling to convince decision makers that the solutions are sound accepted, as is evident in this described scenario: *“it's a lot harder to convince the upper level people that your wild*

new idea is going to work than it is to convince them that the change in torque is going to work, albeit slightly less than that other wild idea”.

5.6.1.2.5. Ambidextrous design work influences work stress

Table 18: Work stress related outcomes of Individual Ambidexterity

Primary construct	Secondary construct	Frequency	+/-
Ambidextrous design work influences work stress	Ambidextrous design work increases negative stress	5	-
	Ambidextrous design work leads to personal compromises	4	-
	Ambidextrous design work reduces stress	1	+

A number of constructs were identified in the analysis of the interview transcripts that relate to work stress outcomes.

Ambidextrous design work increases negative stress

Five participants, who are all categorised as pendulums, according to the individual ambidexterity typology, made statements that were indicative of increase levels of negative stress. Negative stress was described as stress that negatively influences performance and associated expressions like overwhelm. The lived experience of product designers who view individual ambidexterity as contributing to negative stress levels was captured by one participant:” *there's definitely a bit of added pressure, especially from a product designer in our specific environment that it does add pressure to you and stress to you to perform”*. In contrast one participant noted that by achieving ambidexterity their stress levels are reduced since they know their designs are better due to the fact that they were borne out of a combination of exploration and exploitation.

Ambidextrous design work leads to personal compromises

Personal compromises were also described as negative outcomes during the interviews by 4 of the participants. At the one hand the compromises relate to suppressing cognitive preferences for creativity and curiosity as described by one of

the participants: *“It makes it difficult to switch off the creative engineer”* with a another reporting a similar compromise with regards to curiosity: *“my personal compromise would be stopping my curiosity and going over into action”*. At the other a designer described the fact they need to adapt their designs according to existing capabilities as personal compromises that lead to frustration in response to the question that deal with the negative outcomes of individual ambidexterity: *“Only when you have to do a compromise because production is not willing to adjust to your design”*.

5.6.1.2.6. Ambidextrous design work influences personal development

A final construct that emerged from the analysis of the transcripts of thirteen semi-structured interviews is that ambidextrous design work influences personal development positively as identified by a cumulative participant frequency of 3.

Table 19: Personal development outcomes of Individual Ambidexterity

Primary construct	Secondary construct	Frequency	+/-
Ambidextrous design work influences personal development	Ambidextrous design work accelerates development as a designer	2	+
	Ambidextrous design work supports role expansion	1	+

Ambidextrous design work accelerates development as a designer

Two participants identified accelerated development as a designer as a positive outcome of ambidextrous design work, with one noting that *“you build a lot of experience quicker this way to doing just the one part of it”*, with the other noting that *“you get more experience you are exposed to more areas of the company and as engineer, are you better engineer”*. Since the development relates to being exposed to a broader range of knowledge areas and is thus related to the broader knowledge constructs which are both enablers and already noted outcomes of ambidexterity.

5.7. Conclusion on findings

The presented results address the research questions and many of the results correspond to findings already reported on in the literature discussed in Chapter 2,

especially the fact that there are different approaches to achieving ambidexterity at the individual level (balance and temporal dimension), even in a homogenous setting where the individuals are exposed to similar demands and similar support mechanisms.

The idea that there is a tension that is borne out of calls to explore and exploit at the same time is also evident from the outcomes of individual ambidexterity. Additionally, the results support the idea that these tensions can be resolved at the individual level through enabling factors, or exacerbated by inhibiting factors.

The role managers play as key actors in individual ambidexterity also comes to the fore in the results, with managers being able to both enable or inhibit individual ambidexterity. From the outcomes it is also noted that demands to explore and exploit has benefits both from a personal perspective, as well as a product perspective, but that there are less-desirable outcomes that may need to be understood and mitigated through management processes if ambidextrous tensions are left to be resolved at the individual level. It is also noteworthy to reflect on the report that individuals experience different outcomes from ambidextrous demands that emanate from a homogenous context.

CHAPTER 6: DISCUSSION OF RESULTS

Thirteen interviews were conducted with product designers in the earthmoving machinery industry and analysed using thematic analysis to reach a suitable point of aggregation and refinement as presented in Chapter 5. The interviews were guided by the interview guide included in Appendix B, which is aligned to the research questions and existing literature which informed the research questions, as reflected in the consistency matrix that is included in Appendix A.

In this chapter the research findings are discussed in depth by illuminating and contrasting it with references from and discussion informed by relevant current literature, in the process providing a response to the research questions presented in Chapter 3. Rich insights are provided which informed the academic and management implications. This is enabled by establishing an understanding of, and reporting on how product designers view individual ambidexterity and further illuminating the phenomena by isolating internal and external factors identified as enabling or inhibiting individual ambidexterity. The outcomes of individual ambidexterity in the research setting are also discussed at the hand of identified factors, and current literature on the subject. The chapter is concluded with an integrated presentation of the results and a discussion of the possible synthesis among the constructs.

6.1. Discussion of results for Research Question 1 & 2

6.1.1. Discussion of results for Research Question 1

Research Question 1: Establish how product designers achieve individual ambidexterity from a temporal perspective.

Research Question 1 sought to establish how individual product designers viewed and achieved individual ambidexterity with a specific focus on the Product Designer's orientation to the temporal dimension, i.e. whether they cycle between explore and exploit, or whether it is done in a simultaneous manner. Isolating the temporal dimension for each participant further allowed for the type of individual ambidexterity to be determined in conjunction with Research Question 2 below, as proposed by Mu et al. (2020).

In their conceptualisation of ambidexterity that pervades the organisation at all levels, Gibson and Birkinshaw (2004) noted that the demand to explore and exploit can be satisfied at any level in the organisation. It then is up to individual employees to decide when and how to explore and exploit. The temporal dimension was introduced to describe organisational ambidexterity in an attempt to capture “the extent to which ambidexterity is pursued simultaneously or sequentially over time” (Simsek et al., 2009, p. 867). This notion has found footing in the individual ambidexterity literature too and, as discussed in Chapter 2, there is a discourse in the literature with regards to how explore and exploit is achieved in the same time frame at the individual level (Mu et al., 2020; Pertusa-Ortega et al., 2020).

From the one end it is proposed that, at the individual level, ambidexterity be pursued by switching between explore and exploit activities, deliberately separating the activities in time in a temporal fashion (Andriopoulos & Lewis, 2009, 2010; Caniëls & Veld, 2019; Greco et al., 2019; Schnellbacher et al., 2019). Alternatively, in the simultaneous dimension individuals will strive to simultaneously explore and exploit without differentiation (Good & Michel, 2013; Miron-Spektor et al., 2018; Papachroni & Heracleous, 2020; Papachroni et al., 2015).

From the semi-structured interviews, it can be concluded that this contradiction of either switching between explore and exploit, or pursuing it simultaneously is also present at the level of the individual product designers who have to achieve ambidextrous outcomes in their normal work. As reflected in Table 5 ten participants reported that they switch between explore and exploit in a temporal fashion while three of the participants indicated that they achieve ambidexterity by exploring and exploiting in a simultaneous fashion. This supports the relevance of categorising individual ambidexterity according to the temporal dimension as proposed by Mu et al., (2020). The implications for this finding to the current research is further elaborated on in section 6.1.3 together with the results to Research Question 2 which is discussed in the next sub-section.

6.1.2. Discussion of results for Research Question 2

Research Question 2: Establish how product designers view individual ambidexterity from an ambidexterity balance perspective.

This research question was included with the objective to establish how product designers view ambidexterity from the balance dimension perspective, i.e. whether explore and exploit is a mutually excluding dilemma, or achieved on a continuous basis. Establishing the balance dimension for each participant also allowed for the type of individual ambidexterity to be described in conjunction with Research Question 1, at the hand of the individual ambidexterity typology proposed by Mu et al. (2020).

As reported in section 5.4.2 eight participant responses, from seven participants, were categorised as 'Explore and exploit are conflicting endeavours requiring dedicated resource allocation to achieve either'. In direct contrast nine responses, from six participants, were categorised as 'Explore and exploit can be combined in a synergistic manner'. This ambiguity in the results supports the proposal (Mu et al., 2020) that there may be differentiation value by categorising research participants according to the balance dimension.

The secondary construct in which two respondents reported that explore and exploit have to be separated temporally because it is different activities is well represented in the literature them (Andriopoulos & Lewis, 2009, 2010; Caniëls & Veld, 2019; Greco et al., 2019; Schnellbacher et al., 2019).

The single response that the balanced view is influenced by the relatedness of tasks is aligned to a necessary antecedent to achieving the paradox approach proposed by Papachroni and Heracleous (2020). It reflects the fact that in many instances, in order to unlock synergies between explore and exploit, the tasks needed a certain level of relatedness.

6.1.3. Discussion of the proposed individual ambidexterity topology

Mu et al. (2020) proposed that individual ambidexterity be categorised according to the individual's view of the balance dimension and temporal dimensions.

In their presentation of the topology Mu et al. (2020) proposed that future studies of individual ambidexterity determine antecedents and outcomes according to the individual's approach to ambidexterity as informed by their view of the balance dimension and the fashion in which they achieve ambidexterity from a temporal perspective. The achieved sample size of this present research project did not lend itself to extensive evaluation of the typology. It was still interesting to explore the potential differentiation along the typology. Table 5 repeated below for convenience summarises the frequency of each combination that was recorded in this sample.

Table 5 (repeated): Categorisation of research participants according to temporal and balance dimension

		Balance dimension	
		Mutually Exclusive requiring balance	Combined in synergy
Temporal Dimension	Simultaneous	Wire Dancer -	Synergist 3 (A, J, K)
	Sequential switching	Pendulum 7 (B, E, F, G, H, I, L)	Juggler 3 (D, C, M)

Numeric value is the number of participants in the categorisation while the letters indicate which participants

The achieved research sample can be described as seven pendulums; three jugglers; and three synergists. The research sample did not contain any wire dancers, who would view explore and exploit as conflicting, incompatible endeavours, but who achieve these in a simultaneous fashion.

The spread of participants among the profiles that was achieved, in a relatively small sample, indicates that the categorisation may be of value in future studies. Although no wire-dancers were identified in this current research project there are reports of sales-service ambidexterity in which this profile would be relevant (Mu et al., 2020). It is concluded that the results support the proposal that the operationalisation of individual ambidexterity be included in future studies. This may contribute to a firmer

grasp on the underlying factor that drive the ambiguities in individual ambidexterity literature.

6.2. Discussion of results for Research Question 3

Research Question 3: Establish what the factors are that enable and inhibit individual product designers' achievement of individual ambidexterity.

The aim of this research question was to address the objective of identifying internal and external factors that influence the product designer's view and achievement of ambidexterity. This question is aligned with the call for studies that identify motivational and cognitive factors that influence individual ambidexterity that have not been reported on before (Mom et al., 2018), as well as the call for empirical studies that consider specific contextual factors that influence individual ambidexterity (Mu et al., 2020; Pertusa-Ortega et al., 2020).

Through the course of conducting and analysing thirteen semi-structured interviews according to the methodology described in Chapter 4 a number of enabling and inhibiting factors were identified. These findings were based on the participants' description of their lived experience of facing ambidextrous demands as reported in Chapter 5. The identified factors were found to emanate from external influence, as well as internally from the participants, as reported in section 5.5. A number of influencing mechanisms were found to have the potential to both enable and/or inhibit individual ambidexterity in the product designer participants.

6.2.1. External factors influencing individual ambidexterity

A summary of the reported external factors that enable or inhibit individual ambidexterity is listed in Table 20. Constructs that were both identified as enabling and inhibiting were placed alongside each other for ease of reference, and thus the order is not indicative of the relative importance or ranking of the mechanisms.

Table 20: Summary of external enabling and inhibiting factors

External factors influencing the achievement of individual ambidexterity	
Enabling	Inhibiting
Management and management processes that enable ambidexterity	Management and management processes that inhibit ambidexterity
Provided design tools and resources enable ambidexterity	
Team, Peer, Social or organisational interaction factors enable ambidexterity	Team, Peer, Social or organisational interaction factors inhibit ambidexterity
Task or work content and work environment factors enable ambidexterity	Task or work content and work environment factors inhibit ambidexterity
Access to information enables ambidexterity	

It is apparent that all of the inhibiting primary constructs have directly opposing enabling constructs, while there are two additional enabling constructs.

Managerial or individual ambidexterity

Management and management processes were identified to potentially enhance and inhibit individual ambidexterity. As reported in chapter 2 there is an ongoing debate in the literature over whether the ambidextrous tension is tolerated and relieved at the management level. In the case of structural and temporal organisational ambidexterity managers determine who and when to explore and exploit (O'Reilly & Tushman, 2013; Turner et al., 2013). If the choice to explore or exploit is rolled down to the individual level, in the contextual form of organisational ambidexterity, it would be up to individual employees to decide when and in what manner to explore and exploit (Gibson & Birkinshaw, 2004; C. L. Wang & Rafiq, 2014; Zimmermann et al., 2015).

Among others, the most prominent management actions that were identified as enabling individual ambidexterity discussed in Chapter 5 were that managers 'do the high-level planning and prioritisation of work'; 'grant designer task- and time

management autonomy'; 'clearly and frequently communicate vision, goals and progress towards goals'; 'manage the workload of employees to allow time for explore and exploit'; and they 'match the task to the employee's capabilities and interests'. The 'provided design tools and resources' as enabler to individual ambidexterity are also controlled by management decisions.

Management factors were not only reported to enable ambidexterity. Multiple management and management process factors were identified as potentially inhibiting individual ambidexterity. The most prominent of these were that 'multiple demands on available time or too little time allocation'; 'inefficient or overly complicated work processes'; 'veto decisions'; and 'skewed priorities' inhibit ambidexterity.

In their original conceptualisation of contextual ambidexterity Gibson and Birkinshaw (2004) noted that, it is up to individual employees to decide when and how to explore and exploit. 'Granting the individual task- and time management autonomy', which is a form of employee empowerment, was reported as the jointly highest-ranking management factor that enables individual ambidexterity. The report that 'veto decisions' inhibit ambidexterity can also be related to a lack of employee empowerment. Caniëls et al., (2017) reported that an employee empowerment culture is positively related to employee ambidexterity. It can be concluded that the reported result supports the findings by Caniëls et al. (2017) and the original proposition by Gibson and Birkinshaw (2004).

Five managerial actions were identified as influential to achieving project ambidexterity in IT projects as reported by Turner et al. (2016). The actions as discussed in chapter 2 is buffering; gap-filling; integration; role-expansion; and tone setting. The results of the current research, presented in chapter 5, indicate that a number of these managerial actions can be regarded as enabling individual ambidexterity as discussed below.

'Managing the workload of employees to allow time for explore and exploit' was identified as enabling individual ambidexterity by four of the participants, while nine participants reported that 'multiple demands on available time or too little time allocation inhibits individual ambidexterity'. These enablers and inhibitors are

opposites of each other and the enabling action is described well by the description of buffering, in which the team is isolated from unwanted distractions that may affect the team's completion of tasks.

Tone-setting is similar to the secondary construct 'clearly and frequently communicate vision, goals and progress towards goal' identified as enabling by three of the participants. Effective tone-setting will also counteract the inhibitor 'skewed priorities inhibit ambidexterity' which was reported by 3 participants. 'Matching the task to the employee's capabilities and interests' is similar to integration. None of the reported constructs aligns to role-expansion and gap-filling as described by Turner et al. (2016).

A noteworthy observation is that management influence was acknowledged as an enabler more frequently among the pendulums than other participants. A pendulum views explore and exploit as conflicting, incompatible activities. This may lead to person-role conflict, which may have a bearing on their view of the importance of the role management plays in providing a suitable context in which to achieve ambidexterity. In contrast the management related inhibitor 'multiple demands on available time or too little time allocation inhibit ambidexterity' was identified in the descriptions of nine out of thirteen interviews as the most prominent inhibiting factor.

Even though management decisions and management processes were identified as prominent in enabling and inhibiting ambidexterity the discussion pointed to the mediating role that management plays in enabling individual ambidexterity, rather than aligning with the notion that management resolves the tension. A single construct 'management doing the high-level planning and prioritisation of work' can be viewed as managerial ambidexterity in which the balance between explore and exploit is influenced by the management decision. The remaining constructs support the research theme that individuals contribute to organisational ambidexterity by deciding when and how to explore and exploit to solve design problems.

Organisational influences beyond management

The second highest ranking external inhibitor to individual ambidexterity that was reported on in chapter 5 is the 'constraints imposed by existing products and capabilities'. This challenge of achieving ambidexterity in product design was also

described as the 'possibilities-constraints' ambiguity in firm level research of how ambidexterity is achieved in leading product design firms (Andriopoulos & Lewis, 2010). The fact that this is experienced as an inhibitor at the individual product designer's level supports the notion that ambidextrous tensions can be experienced at any level in the organisation, as proposed by Gibson and Birkinshaw (2004) and confirmed in subsequent research (Caniëls et al., 2017; Caniëls & Veld, 2019; Zimmermann et al., 2018). It furthermore extends a firm level operationalisation of ambidexterity in product design to the individual unit of analysis.

It was further found that team, peer and organisational interaction factors can both enable and inhibit individual ambidexterity. The most prominent constructs in this setting were 'silos and lack of shared vision and goals in other teams' and 'cross functional integration demands' inhibit individual ambidexterity. 'Silos and lack of shared vision and goals in other teams' as inhibitor can be related to tone-setting as discussed in the management factors, and indicates that tone-setting across teams who interact may be an important factor in achieving individual ambidexterity.

The reports that cross functional integration demands inhibit individual ambidexterity stands in contrast with the general finding that high cross-functional coordination supported increased levels of individual ambidexterity reported by Tempelaar and Rosenkranz, (2019). In the prior research it was however reported that the influence of cross functional integration was lower for individuals with a high role segmentation orientation. Product design is a specialist role and cross functional integration as an inhibitor was only reported by two out of thirteen participants. It is plausible that this specialist role is associated with high role segmentation, offering a possible explanation for the contradiction.

Conclusion: External factors influencing individual ambidexterity

It can be concluded that both managerial decisions and processes as well as organisational factors like cross functional integration demands influence the individual view of external factors inhibit or enable ambidexterity. As discussed, the different factors that were discussed are well represented in the ambidexterity literature. It is furthermore prudent to note that the majority of the factors identified as enabling individual ambidexterity are also inhibiting to individual ambidexterity if they are not addressed effectively. The results presented in chapter 5 also identify

internal factors that influence the achievement of individual ambidexterity, which is discussed in the next section of this report.

6.2.2. Internal factors influencing individual ambidexterity

A summary of the factors that enable or inhibit individual ambidexterity that is categorised as being internal to the individual is listed in Table 21. As before, themes that were both identified as enabling and inhibiting were placed alongside each other for ease of reference, and the order is not indicative of the relative importance or ranking of the factors.

Table 21: Summary of internal enabling and inhibiting factors

Internal factors influencing the achievement of individual ambidexterity	
Enabling	Inhibiting
Knowledge, experience and information factors enable ambidexterity	Knowledge, experience and information factors inhibit ambidexterity
Time management techniques and factors enable ambidexterity	
Personal factors enable ambidexterity	Personal factors inhibit ambidexterity
Skills, techniques and capabilities enable ambidexterity	Skills, techniques and capabilities inhibit ambidexterity

The most prominent internal factor that enables individual ambidexterity, reported on in sections 5.5.1.2 and 5.5.2.2, relates to ‘knowledge, experience and information factors’. A cumulative count of thirteen participant references were categorised as enabling while six references were categorised as inhibiting. ‘Time management techniques and factors that enable ambidexterity’ was identified as the second highest ranking internal enabling factor with a cumulative count of eleven references., while no inhibiting factors related to this construct were reported. ‘Personal factors’ that enable and inhibit ambidexterity was the next highest-ranking construct with eleven participant references categorised in this group, while three inhibiting factors were identified. ‘Skills, techniques and capabilities’ were identified as the last internal factor that enables and inhibits ambidexterity. This variety of individual factors that act as antecedents to individual ambidexterity is discussed next.

6.2.2.1. Individual discretion and individual ambidexterity

A number of the internal factors that were identified as enabling or inhibiting individual ambidexterity relates to discretionary decisions made by the employee. In the 'knowledge, experience and information factors' construct the most prominent construct is that the participants rely on their experience to guide the prioritisation of their own work, implying that the final prioritisation is done at their own discretion following high level prioritisation which was reportedly done by managers.

In a construct that also points to individual discretion the most prominent enabler in the 'time management techniques and factors construct' is that the participants reported to match their cognitive cycle to specific tasks in the planning of their work. A further discretionary act undertaken by employees is to break tasks up into digestible portions. The reported discretionary decisions about their own work are only possible if the individual employees are empowered to make such decisions, and thus these internal factors have a level of empowerment as a necessary antecedent. The alleviating effect a sense of control has on experienced role conflict is reported on in literature (Jensen et al., 2013). This may indicate that the enablement employees experience is driven by a reduction in the experienced role conflict.

6.2.2.2. Other internal factors that influence individual ambidexterity

Four participants identified that 'understanding the impact of decisions on others' enables their individual ambidexterity. It was reported that this entails an understanding of the implications design choices has for the rest of the organisation and incorporating this knowledge in the design. This enabling factor is closely related to the possibilities-constraints paradox identified by Andriopoulos and Lewis, (2010) in their study of ambidexterity in leading product design firms as an approach that enables ambidexterity. Andriopoulos and Lewis, (2010) reported that successful design firms understand the constraints that current capabilities and products place on the possibilities that are to be explored and, in the process new and novel products can be designed that integrates with existing products and process.

From time to time, it is not possible to please all the parties involved in effecting the design changes. In these instances, 'influencing and persuasion skills and tactics',

identified as enabling individual ambidexterity by three participants, are necessary to lead all involved in the same direction. Booth (2017) identified influence and persuasion abilities as enabling factors of individual ambidexterity among managerial employees. The finding in this study extends that finding to the individual employee level.

'Lacking specific knowledge or experience' was identified by four participants as an internal factor that inhibits ambidexterity. The influence of knowledge flows in individual ambidexterity is addressed in current literature (Mom et al., 2007; Torres et al., 2015). Organisations can support individual ambidexterity by identifying and granting employees access to critical knowledge and experience that guides individual explore and exploit decisions. This can be achieved through deliberate knowledge flows and giving employees the opportunity to develop their experience in the specific fields they work in. The link between knowledge and experience is also evident from the outcome that individual ambidexterity broadens knowledge.

6.2.3. Conclusion: Factors enabling and inhibiting individual ambidexterity

It can be concluded that both internal and external factors act to enable individual ambidexterity, but that many of these same factors have inhibiting potential as well. The role of management in enabling individual ambidexterity is apparent from the results. The discretionary type internal factors can only enable ambidexterity when the individual employees are granted the autonomy to make those discretionary decisions, indicating an interplay between the of the internal and external factors that relate to autonomy and discretions. All of the reported enablers and inhibitors are well represented in existing ambidexterity literature as discussed. It is prudent to note that while most of the factors discussed is represented in existing literature the existing literature was mostly aimed at managerial ambidexterity, and this research indicates that many of the factors identified as influencing managerial ambidexterity also influences individual ambidexterity.

6.3. Discussion of results for Research Question 4

Research Question 4: Establish what the perceived benefits and perceived negative outcomes are of achieving individual ambidexterity.

This research question was intended to address the objective of identifying the outcomes of individual ambidexterity. Mu et al. (2020) noted that positive outcomes of individual ambidexterity have been reported on in some studies, but that very few studies reported on negative outcomes of ambidexterity, this present research focused on both positive and negative outcomes of individual ambidexterity.

A variety of positive and negative outcomes, which were identified by conducting thematic analysis on the responses of the participants in the semi-structured interviews was presented in section 5.6 of this report. While the vast majority of outcomes influence the participants on an individual level some of the outcomes are manifested in the environment external to the participant. The internal outcomes are discussed first followed by a discussion of the external outcomes.

6.3.1. Internal outcomes of individual ambidexterity in product design

The internal outcomes of individual ambidexterity were grouped under seven primary constructs which covered knowledge outcomes; integration demands; motivation; how tasks are viewed; job satisfaction; stress; and personal development. A mixture of positive and negative outcomes was presented under each of the constructs. Many of the positive outcomes are documented in existing individual ambidexterity literature, while the negative outcomes fill a gap in the literature as discussed below.

6.3.1.1. Individual ambidexterity and knowledge

Two positive outcomes related to knowledge was reported. In the first result nine out of the thirteen of participants reported that achieving individual ambidexterity broadened knowledge because it necessitated the participant to work on a broader array of topics. The context of the finding was that by adding exploitation to exploration work led to being involved in “*more, different designs*” and the broad knowledge is thus gained from a breadth perspective. The results also report on accelerated development through broader work involvement, a finding that supports

broader knowledge gains stemming from demands to explore and exploit (G. Wang et al., 2019).

Swart et al. (2019) explain that exploitation requires specialist knowledge while exploration requires general knowledge. The finding of this current research project however indicates that increasing product designers' involvement in exploitation of existing products contributes to broad knowledge gains. The combination of broad knowledge gains reported in this context, and the broad knowledge reported to be required for exploration, can thus increase exploration in a virtuous cycle.

The second finding, although noted by only 2 participants, was that achieving individual ambidexterity creates the opportunity for knowledge transfer from colleagues. G. Wang et al. (2019) reported that boundary spanning requirements contributed to knowledge acquisition from colleagues in their study of the individual ambidexterity of IT employees, which is a similar finding to this reported outcome.

6.3.1.2. Individual ambidexterity and integration demands

In contrast with the positive outcome of learning from others the integration demands that are brought about by individual ambidexterity in this context was reported as a negative outcome in a cumulative total of 8 participant responses. In an a-social report of the outcomes of individual ambidexterity six participants reported that ambidextrous design work required more social and cross functional integration and positioned this as a negative outcome. It was explained that these demands were brought about by the exploit part of the job which was added to the preference for explore to achieve individual ambidexterity. Prior research into boundary spanning and integration effects on achieved levels of individual ambidexterity is reported in in prior literature (Caniëls et al., 2017; G. Wang et al., 2019). This current research findings that these demands are experienced as negative outcomes on the individual level is a unique contribution to the individual ambidexterity literature

In a related negative personal compromise construct it was reported that due to the cross functional integration demands diversity has to be tolerated in order to achieve cohesiveness. This diversity-cohesiveness paradox was also reported on as one of the paradoxical approaches deployed by successful design firms (Andriopoulos & Lewis, 2009, 2010). This finding extends the firm level finding reported by

Andriopoulos and Lewis (2009, 2010) that compromises may be necessary and this present project describes how it leads to negative outcomes at the individual level. This finding furthermore supports the findings that ambidexterity is a multilevel construct with outcomes affecting multiple different levels (Mom et al., 2018; Pertusa-Ortega et al., 2020; Simsek, 2009).

The negative outcomes may also have indirect implications for employee satisfaction. A number of other factors were identified as influencing job satisfaction and motivation more directly.

6.3.1.3. Individual ambidexterity, satisfying work and motivation

A majority of ten participants reported that ambidextrous design work is rewarding and that it increases their job satisfaction on the whole. A number of factors were identified in the analysis process that contribute to this holistic view.

On the positive side of job satisfaction and motivation, four participants reported that the task variety associated with exploring and exploiting keeps work interesting. A further four responses indicated that the problem solving and opportunity to implement change by exploring and exploiting contributes positively to job satisfaction. The positive correlation between task variety and job satisfaction was reported on in literature as early as 1975 (Hackman & Oldham, 1975).

Contrary to the positive outcomes, negative outcomes related to job satisfaction and motivation was also reported. In an example of person-role conflict four participants reported that they need to perform exploit tasks, which are less enjoyable than the explore work they are passionate about, to complete their work. This may indicate that the combined demands to explore and exploit reduces job satisfaction and motivation. Role conflict as an outcome of individual ambidexterity was also reported on by Gabler et al. (2017). The passion-discipline paradoxical view was proposed as a solution to this dilemma. The passion the designer has for exploration and novelty can be combined with exploitation work that is executed as part of well-defined processes with clear roles, and driven by clear objectives and targets (Andriopoulos & Lewis, 2009, 2010).

A further negative outcome that was identified is the performance loss which is brought about by task switching losses as reported by three participants. The task switching losses as an outcome of individual ambidexterity is addressed in current literature (Greco et al., 2019). Switching losses will consume available slack in planning and thus may contribute to feelings of role-overload.

6.3.1.4. Work demands and stress

In a construct that is closely related to job satisfaction it was also reported that the demand to explore and exploit in combination influences the participants outlook on work tasks. Time management was reported as enabling ambidexterity, and in a related outcome the need to time manage due to the nature of the work was also identified as an outcome. This negative outcome was especially prominent among participants who also reported regarding explore and exploit as being mutually exclusive, indicating that role-overload, where the required resources exceed the available resources, could set in.

Five participants reported negative stress as an outcome of the demand to explore and exploit. It is not clear whether the demand to explore and exploit is the primary source of pressure, or additional pressure to already existing high stress demands in the work place. Feelings of over-pressure are also identified in the role-conflict literature, while HPWS were found to contribute to over-pressure (Jensen et al., 2013; G. Wang et al., 2019). It may be of value to investigate if the feelings of negative stress that is associated with ambidexterity can be isolated from general higher levels of job demand and job stress in the workplace, which can in turn inform future job design decisions. It will furthermore have value to determine to what extent additional slack in planning can alleviate the sense of overload.

In another example of a person-role conflict related negative outcome, four participants reported that at a personal level individual ambidexterity in design demands personal compromises from them. The reported compromises are captured in the paradoxical view of product design ambidexterity as described by (Andriopoulos & Lewis, 2010).

6.3.1.5. Conclude internal outcomes

In sum a combination of positive and negative outcomes was reported as stemming from individual ambidexterity. These outcomes are related to performance, job satisfaction, knowledge and experience and integration demands.

Job satisfaction is a prominent theme in the personal outcomes of individual ambidexterity. From a negative perspective the personal outcomes that relate to integration demands and internal compromise and negative stress can be categorised under role conflict as a higher-level outcome of individual ambidexterity. Additionally, the need to time-manage as a negative outcome may indicate that individual ambidexterity contributes to sense of role overload as well. Role overload is implied in the inhibitor construct 'multiple demands on available time or too little time allocation' as well. It was also reported that individual ambidexterity influence

Positive implications for job satisfaction were also reported, namely that the task variety and opportunity to implement positive change increases job satisfaction. These factors are well aligned with the well-researched Job Characteristics Model (Hackman & Oldham, 1975) and future research with a specific focus on the outcomes of individual ambidexterity at the hand of the JCM may be of value.

6.3.2. External outcomes of individual ambidexterity in product design

The external outcomes of individual ambidexterity were reported on under two primary constructs 'ambidextrous design work influences efficiency and performance' and 'team members or colleagues benefit from ambidextrous design work'.

A total of eleven datapoints referring to positive outcomes of individual ambidexterity were allocated to the construct 'ambidextrous design work influences efficiency and performance' while six quotes reflected negative outcomes. The areas that were identified as being influenced by individual ambidexterity were the quality of the designs, efficiency and work being discarded.

6.3.2.1. Individual ambidexterity and design quality

One participant noted that they believed designs which were the product of individual ambidexterity weren't as good as designs that were borne from specialist, isolated

explore and exploit work. In contrast nine participants noted that an outcome of combining explore and exploit is that improved designs are achieved.

The first noted source of improvement that was reported is the fact that switching between tasks or context allowed for a fresh perspective when focus is returned to the original design task. This perspective of the benefits of changing contexts is supported by Lu, Akinola and Mason's (2017) finding that task switching reduces cognitive fixation and in the process enhances creativity.

A further source of design improvement was ascribed to the fact that by both exploring new design possibilities and exploiting current possibilities knowledge is gained. In a related internal outcome nine participants reported that individual ambidexterity in design broadens design knowledge. This new knowledge in turn informs future designs, yielding designs that incorporate aspects of exploring and exploiting activities in a synergistic manner, as described in the paradoxical activity 'Capitalising on previous efforts' (Papachroni & Heracleous, 2020).

The knowledge gains include knowledge about the organisations established capabilities. When designs are adapted with consideration for these capabilities the result is designs that can be accommodated better in existing production processes. This also relates to the reported external outcome that colleagues benefit from ambidextrous design work. This phenomenon is captured in existing literature in Andriopoulos and Lewis', (2010) proposal that the possibilities-constraints dilemma be overcome by experimenting within boundaries, in the process promoting creativity associated with explore and commercial success from improving existing processes.

The finding that designs are improved as a result of achieved individual ambidexterity is supported by different sources in current literature. The improvement stems from reduced cognitive fixation as a result of task switching demands of ambidexterity, while knowledge gains influence the design positively. Achieving a paradox mindset in design yields further design quality benefits to the organisation that span beyond the individual.

6.3.2.2. Individual ambidexterity and design efficiency

Although designs were reported to improve when individual ambidexterity is achieved a prominent result was that lower levels of efficiency is achieved, as reported by five of the participants. In contrast two participants reported increased efficiency due to the synergies that can be achieved in combining explore and exploit.

It is prudent to note that the five participants who reported lower efficiency when individual ambidexterity is achieved also view explore and exploit as mutually exclusive outcomes and thus by doing both explore and exploit work, the resources available are spread thinner and all tasks take longer to complete. A further loss of efficiency is reported switching costs that is incurred when individuals switch cognitively between explore and exploit.

Greco et al. (2019) recommended that the frequency of switching be managed to ensure that the gains of switching and individual ambidexterity exceed the losses of switching. The extent to which the gains in design quality outweigh the switching losses falls outside of the scope of this research project but is an interesting aspect of individual ambidexterity to explore in future research.

6.4. Integration of results and conclusion

In the preceding sections of this Chapter the results to the different research questions were discussed in isolation. In this section the results will be combined to form an integrated presentation of the results as they relate to Individual Ambidexterity in the context of product designers in the earth moving equipment manufacturing industry. In section 6.4.2 a diagram is presented which integrate the results of Research Questions 3 and 4, depicting the relation of the different results to individual ambidexterity.

6.4.1. Relevance of individual ambidexterity topology

Research Question 1 sought to understand how product designers achieved individual ambidexterity, specifically from a temporal perspective. Ten participants indicated that they achieve ambidexterity by sequentially switching between explore and exploit while three participants pursue explore and exploit endeavours in a simultaneous fashion.

Research Question 2 sought to determine how product designers viewed explore and exploit from a balance of individual ambidexterity point of view. Seven participants reported that they view explore and exploit as vying for the same resources and thus a balance has to be struck between them, while six participants reported that they view explore and exploit as synergistic in nature.

The results from Research Questions 1 and 2 were combined to categorise the respondents according to the typology as proposed by Mu et al. (2020). The categorisation spread over this small sample of respondents indicates that the typology may be useful to categorise specific types on individual ambidexterity. Although the achieved sample of this current research is too small to draw definite conclusions there are indications of some differentiation in the results of the other research questions according to the typology, supporting the applicability of the categorisation.

An example of indicated differentiation in Research Question 3 results is that the construct that 'High level planning and prioritisation' being performed by management is an enabler to individual ambidexterity was only identified by participants who achieve ambidexterity through sequential switching, i.e., Pendulum and Juggler profiles. Additional differentiation was indicated in Research Question 4 results. Only pendulums, who view explore and exploit as competing for the same resources reported that 'Ambidextrous design work reduces job satisfaction and motivation due to the demand to do less favoured tasks'. On the contrary participants from all the categories identified 'Granting designer task- and time autonomy' as an enabler and 'Ambidextrous design work is rewarding work and increases job satisfaction' as an outcome. In sum there are indications that further investigation into the usefulness of the typology to explain variation in the reported aspects relation to individual ambidexterity is merited.

6.4.2. Enablers, inhibitors and outcomes of individual ambidexterity

Research Questions 3 sought to identify factors that inhibit and/or enable individual ambidexterity, while Research Question 4 sought to identify positive and negative outcomes of individual ambidexterity. In isolation there was some interrelation between constructs as they relate to the specific questions but when the results of these two research questions are viewed in a holistic combined fashion, multiple

linkages between the different factors and outcomes become apparent. A diagrammatic layout of the results was developed to aid with the identification of these linkages. Figure 3 on the next page depicts the key results of the current research project. In order to support the practicality of the presentation only primary constructs are included on the diagram. It is however important to consider specific secondary constructs' relation to derive maximum value from the combined result of research questions 3 and 4. The next sub-section is devoted to a description of the diagram layout and functionality, after which the integrated results are discussed.

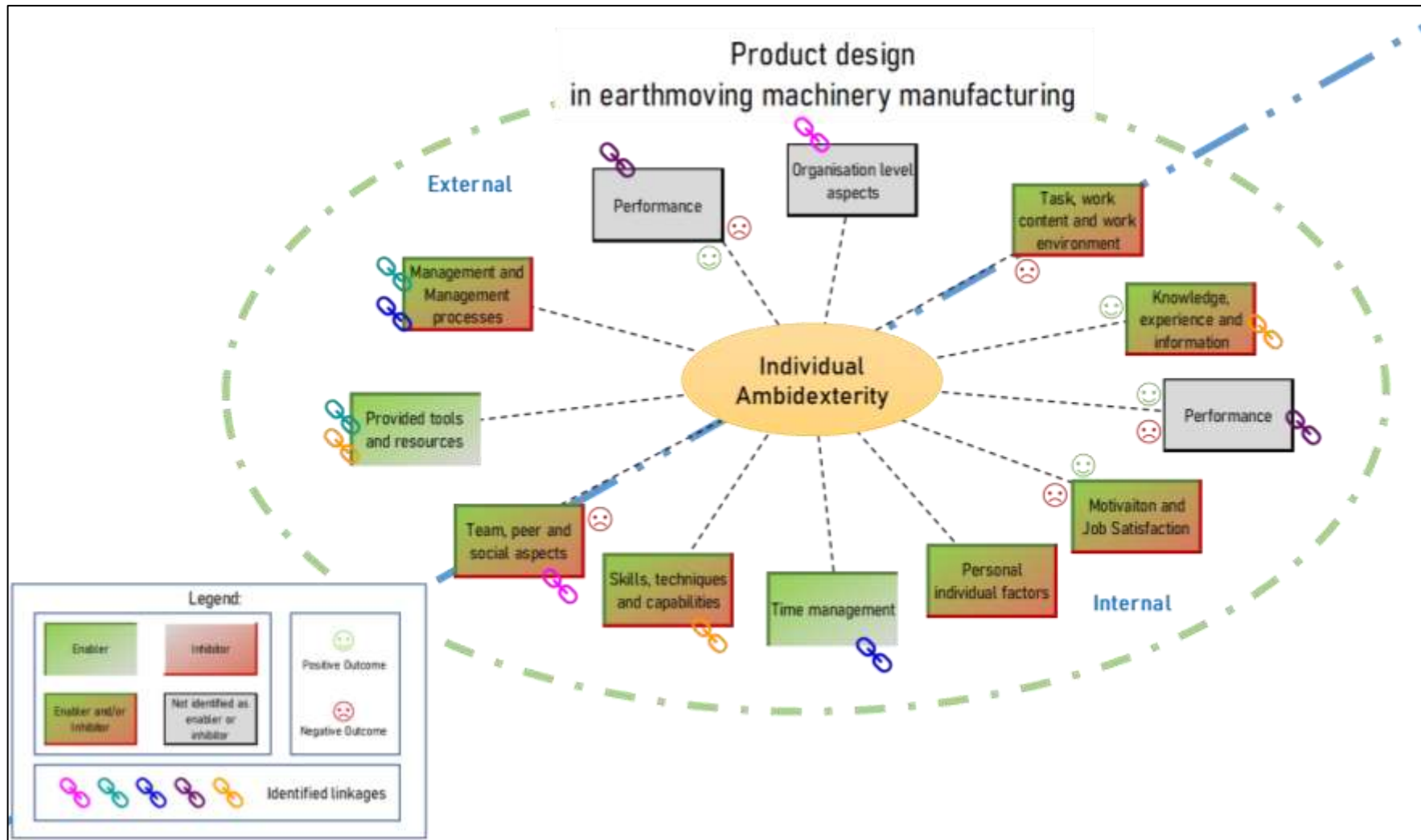


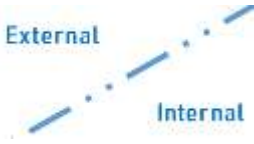





Figure 3: Integrated presentation of results: Enablers and inhibitors and outcomes of individual ambidexterity

6.4.2.1. Diagram design

The diagram, shown in Figure 3, would only have value if it is possible to depict key aspects and findings that arose from the research. From this perspective it was necessary to consider both inhibiting and enabling factors, as well as positive and negative outcomes in the design of the diagram. It is furthermore prudent to note that this research was conducted in a very specific context. The consideration for these aspects in the diagram design was achieved by intentional inclusion of the design elements as described in Table 22 below.

Table 22: Functions of different diagram design elements

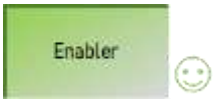
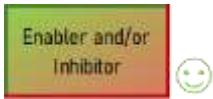
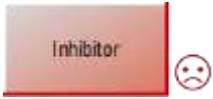
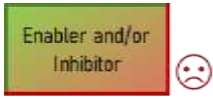
Design element	Function
	The green dotted ellipsoid forms the external border of the diagram, indicating that the findings were made within the boundary of product design in the earth moving manufacturing industry.
	The centre shows that individual ambidexterity was the specific research focus in this setting.
	The results were positioned as either internal to the participant or external in the environment. The blue dotted diagonal line that splits the diagram into two sections, aptly named internal and external sections.
	The most prominent constructs are placed around the centre, categorised as internal or external and identified according to whether they were identified as enabling or inhibiting individual ambidexterity by applying a shading to the element as reflected in the legend.
	Markers are placed next to the constructs to indicate when they are impacted by positive and negative outcomes of individual ambidexterity.
	Other linkages between constructs that warrant identification are identified with colour matched link symbols

In combination the different design elements allow for the synthesis of the results of Research Questions 3 and 4 as discussed in the next subsection.

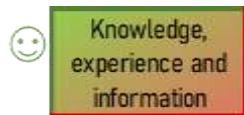
6.4.2.2. Virtuous cycles and vicious cycles

The diagram design enables the viewer to identify virtuous and vicious cycles. A virtuous cycle occurs when positive outcomes fuel enablers or suppresses inhibitors. In these instances, it is possible that multiplier effects may substantially increase the achieved individual ambidexterity. A vicious cycle may occur when negative outcomes are combined with inhibitors, leading to a scenario where the inhibiting effect is strengthened by negative outcomes. The potential virtuous and vicious cycles can be identified on the diagram for further investigation as described in Table 23 below.

Table 23: Identification of vicious and virtuous cycles of individual ambidexterity

Element combination		Description
		When positive outcomes occur with enablers it indicates potential virtuous cycles
		When negative outcomes occur with inhibitors it indicates potential vicious cycles

Knowledge virtuous cycle



In section 5.5.1.2 'Broad knowledge and experience' was identified as an enabler of individual ambidexterity. In section 5.6.1.2 it was reported that 'Ambidextrous design work broadens design knowledge'. In combination these two results imply a self-fulfilling cycle in which the broad knowledge gained from individual ambidexterity enables the employee to achieve higher levels of ambidexterity.

Motivation virtuous cycle



'High motivation levels' were identified as an enabler to individual ambidexterity in section 5.5.1.2 while it was reported that 'Ambidextrous design work is rewarding work and increases job satisfaction and motivation' in section 5.6.1.2. While both of these constructs are well represented in the literature the synthesis of the enabler and positive outcome points to a potential virtuous cycle that could be leveraged.

Motivation vicious cycle



Motivation and
Job Satisfaction

A 'Lack of motivation' was cited as an inhibitor of individual ambidexterity in section 5.5.1.2 while it was also reported by some participants that 'Ambidextrous design work reduces job satisfaction and motivation due to the demand to do less favoured tasks'. This reflects a potential vicious cycle in which the reduced motivation as an outcome drives lower levels of ambidexterity. Caniels et al. (2017) and Mom et al. (2018) reported that higher intrinsic motivation orientation was associated with higher levels of individual ambidexterity. It is thus possible that internal- and/or external motivation orientations could moderate this vicious cycle.

Integration vicious cycle

Team, peer and
social aspects



In section 5.5.2.1 it was reported that 'Cross functional integration demands inhibit ambidexterity', while a negative outcome was that 'Ambidextrous design work demands social or cross functional integration'. Based on the results this points to a potential vicious cycle. Extant research reports that increased cross functional involvement could have negative effects on individual ambidexterity, but this was only true for individuals with a high integration orientation (Tempelaar & Rosenkranz, 2019). This example accentuates the notion that the identified potential virtuous and vicious cycles may be dependent on other factors too.

Task, work content and work environment vicious cycle:

Task, work
content and work
environment



In the diagram a potential inhibitor and negative outcome match that relates to 'Task, work content and work environment' is indicated. Two inhibitors were reported on in this regard, 'Constraints imposed by existing products and capabilities inhibit ambidexterity' and 'Mundane task demands inhibit ambidexterity'. The identified negative outcomes related to this construct are 'Ambidextrous design work brings a need for time management'; 'Ambidextrous solutions require more selling'; 'Ambidextrous design work makes design activity more challenging'. It is concluded that no secondary constructs were reported that could fuel a vicious cycle. This confirms the notion that the diagram merely identifies potential vicious and virtuous cycles.

6.4.2.3. Other identified linkages

Figure 3 also reflects linkages beyond the potential virtuous and vicious cycles discussed in 6.4.2.2, which were reported to affect individual ambidexterity.

Management and Time management: Time management techniques were identified as enabling individual ambidexterity. These techniques can however only have an impact at the individual level if the individual is granted time management autonomy, which was identified as an enabler that is determined by management, as such these enablers have a logical dependency. This illustrates the importance of an empowerment culture to support individual ambidexterity as reported by Caniëls et al. (2017).

Management and provided tools: It was reported that the 'Provided design tools and resources enable ambidexterity'. These tools and resources are however made available at management's discretion and as such the construct cannot be detached from the role management plays in individual ambidexterity. When employees face tension emanating from ambiguous goals like explore and exploit some of the tension can be alleviated by providing them with suitable tools and resources.

Internal and external performance outcomes: In this current research it was reported that individual ambidexterity leads to better designs, an individual performance characteristic. It was also reported that the designs are improved because they suit the organisation better, an organisational performance outcome and as such the fact that the individual performance is improved has related outcomes for the organisational performance. The contribution individual ambidexterity makes to organisational ambidexterity was confirmed in prior research (Mom et al., 2018; Swart et al., 2019). This current study extends this point to show that individual performance gains that emanate from individual ambidexterity could contribute to firm performance gains in a win-win situation.

Knowledge experience and information; Skills techniques and capabilities; and Provided tools and resources: The three constructs work in combination to derive the best possible value from the provided tools and resources. Employees require the correct skills, techniques and capabilities to utilise the provided tools and resources that support individual ambidexterity, while it was also reported that

knowledge and experience guides the employees to which tools to use when. For this reason, these three constructs are identified as having dependency and should be considered in combination when interventions are designed to enhance individual ambidexterity.

Team, peer and social aspects and Organisational level aspects: A strong element of the secondary constructs that relate to team, peer and social aspects was associated with the cross functional integration element of the design work. These cross functional integration requirements are brought about by the organisational design and as such these elements are interlinked. A suitable organisational design may alleviate the negative aspects and outcomes of cross functional integration requirements that are identified in this individual ambidexterity study.

In the first academic implication this supports calls that ambidexterity and specifically individual ambidexterity research be approached from a multi-level perspective (Jensen et al., 2013; Mom et al., 2018; Pertusa-Ortega et al., 2020; Simsek, 2009). In the second implication for academia this identifies a need for further research into such suitable organisational design and its elements may inform future interventions to best achieve individual ambidexterity.

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

The purpose of the research project was to gain a deep understanding of product designers' lived experience of achieving ambidextrous outcomes in the normal course of their work in the earthmoving manufacturing industry. This deep understanding explored how explore and exploit is viewed (balance dimension) and achieved (temporal dimension), while also exploring how this view and experience is influenced by internal and external factors. Finally, it was intended to learn what the outcomes of individual ambidexterity are in this setting. This chapter concludes the research report in its' presentation of principal findings which is presented next, and followed by the contribution to literature and the implications for management and other stakeholders.

7.1. Principal findings

The principal findings of this current research project relate to the operationalisation of individual ambidexterity, the outcomes of individual ambidexterity, and a synthesis of results that identifies the key role management and knowledge play in achieving individual ambidexterity.

7.1.1. Operationalisation of individual ambidexterity

This current research project confirms that individual ambidexterity can be achieved by different approaches. It was confirmed that the balance and temporal dimensions describe the different operationalisations of individual ambidexterity that was encountered in this research. In sum the individual ambidexterity typology (Mu et al., 2020) holds potential differentiation ability to categorise different operationalisations of individual ambidexterity.

7.1.2. Role conflict, role overload and job satisfaction

Numerous calls were made for empirical research that reports on the negative outcomes of individual ambidexterity. The key findings related to the negative outcomes of individual ambidexterity is an indication that achieving individual ambidexterity requires high tolerance for role conflict and role overload. The reported contributors to role conflict are 'integration demands' and 'personal compromise', while integration demands, the need to manage time and that individuals experience multiple demands on time as inhibiting individual ambidexterity, contribute to role

overload. The eventual outcome of increased negative stress was also reported which supports this finding.

7.1.3. Management's role as a key actor in individual ambidexterity

Although contextual ambidexterity theory posits that it is up to individuals to decide when to explore and exploit (Gibson & Birkinshaw, 2004), the results of this present research project reflect the central role management continue to play in enabling individuals to achieve ambidexterity. From the results it is apparent that the manner in which management provide direction, empower employees, make resources available, set the tone and distribute work can contribute to individual ambidexterity. The knowledge management distribute is also an influential factor.

7.2. Knowledge and individual ambidexterity

The role knowledge plays in the pursuit of individual ambidexterity is an additional principal finding of this research project due to the breadth of influence of knowledge across different constructs. Knowledge and experience furthermore guide employees' use of the resources and tools that management make available to them in combination with top-down knowledge flows. Knowledge acquisition has the ability to in, a potentially virtuous manner, fuel future ambidexterity.

7.3. Virtuous and vicious cycles of individual ambidexterity

This present research also identified potential virtuous and vicious cycles of individual ambidexterity. It is posited that in these cycles outcomes and antecedents could work in a synergistic fashion to either fuel or diminish individual ambidexterity. The posited virtual cycles are the knowledge virtuous cycle and motivational virtuous cycle, while the posited vicious cycles are the 'integration vicious cycle' and 'motivation vicious cycle'

The contribution to literature is discussed in the next section.

7.4. Contribution to literature

This present research project makes a number of contributions to the limited but growing literature on non-managerial individual ambidexterity. It is also, to the

author's best knowledge, the first exploratory study to focus on individual ambidexterity in a product design setting.

Further to the general contribution this study contributes to the limited literature on the negative outcomes of individual ambidexterity by identifying a number of negative outcomes of individual ambidexterity. This contribution also allowed for recommendations to be made that may guide future research in this regard.

By reporting on the operationalisation of individual ambidexterity this study confirmed that the delineations in the literature that relate to the balance and temporal dimensions of individual ambidexterity do occur in reality. This finding furthermore supports the relevance of the individual ambidexterity topology proposed by Mu et al. (2020). The study also explored and reported on the potential differentiation capability that is contained in the typology.

The final noteworthy contribution of this study to literature is the presentation of a diagrammatic layout that enables researchers to identify potential vicious and virtuous cycles.

The findings of the research also informed implications for management and other stakeholders which are reported on next.

7.5. Implications for management and other relevant stakeholders

This study allows for implications to managers and individuals to be identified and reported.

7.5.1. Management implications

This study reports on multiple implications for managers in firms where the achievement of individual ambidexterity is intended. The first implication for management relates to the first reported principle finding that managers are key actors in the achievement of individual ambidexterity. It is recommended that managers acknowledge their key role in individual ambidexterity and how the direction they provide, empowerment of employees, making resources available, setting the tone, sharing of information and distributing work can contribute to

individual ambidexterity. If these aspects are addressed in a suitable fashion individual ambidexterity will contribute to improved designs which suit the organisation better, while pursuing radical renewal.

Managers should also take note of the reported negative consequences of pursuing individual ambidexterity. Managers should be aware that individual ambidexterity may contribute to role conflict and role overload, which is associated with multiple reported negative outcomes of individual ambidexterity. This may require deliberate job design and workload adjustments in specific high-pressure environments.

7.6. Implications for ambidextrous individuals

Some examples of the paradoxical approach to ambidextrous demands as proposed by Papachroni and Heracleous (2020) were evident in the reported results, supporting the notion that a paradoxical approach may make the tension that arises out of ambidextrous demands more tolerable. It is recommended that individuals facing these demands leverage hybrid tasks, capitalise on previous efforts and seek synergies between exploration and exploitation. This may enable individuals to take ownership of their own individual ambidexterity.

The limitations of the research are discussed in the next sub-section.

7.7. Limitations of the research

While the research design imposed some limitations on this research project, as discussed in Chapter 4 there are other limitations as well. In summary

- Although the unit of analysis was the individual product designer and the achieved sample met the sample criteria, the fact that non-probability sampling methods were deployed and that all the respondents are employed in the same firm limits the study. This limits the generalisability of the findings.
- The fact that all participants are employed in the same firm, bounds the contextual factors the employees are exposed to is limited. It can be reasonably expected that other contextual factors may exist that will inhibit or enable individual ambidexterity.
- The achieved sample size limits the generalisability of the reported observations of the applicability of the individual ambidexterity topology.

- The researcher was not expertly trained or experienced executing qualitative research. This was however addressed as stated in section 4.8.
- All interview were conducted over the internet without video limiting the opportunity to detect non-verbal cues such as discomfort around specific themes or questions.
- The researcher was previously employed in a product designer role in the target population and thus the researcher also has personal experience of the phenomenon being researched.
- The researcher was personally acquainted with the sample and this in itself could have influenced the depth to which the participants offered information perceived as negative. In order to address this limitation no data that could reveal the participants' identity is reported. Further to this, participants were assured that all responses would be anonymised upon reporting, and only consenting participant's interview responses were reported on.
- All participants are male and this may limit the breadth of antecedents and outcomes identified. However, gender dimensions are outside the scope of this study and all participants are representative of the intended sample population, being non-managerial product designers who have to achieve ambidextrous outcomes in the completion of their daily work.
- All of the data recorded and on which the analysis and findings are based is self-reported. Steps were taken to minimise the impact of self-reports on the data validity as described in section 4.7.

The limitations of the study, together with the reported findings informed the suggestions for future research in the next section.

7.8. Suggestions for future research

The research presented contribute to the scant literature on individual ambidexterity in non-managerial employees. The study was of an explorative nature and uncovered factors which are influential in achieving individual ambidexterity as well as outcomes of individual ambidexterity. The following suggestions for future research are informed by the findings and the reported limitations

- In order to address the generalisability limitations it is proposed that the study be repeated in other samples and contexts where individual ambidexterity is

a necessity for non-managerial employees. Such studies will improve the generalisability of recurring findings and allow for the isolation of context specific factors.

- Since this research was of an exploratory nature the opportunity to identify which factors are most and least influential is limited. It is therefore proposed that deductive research be undertaken to determine if any of the identified factors are more influential than others.
- Research that aims to identify which of the enabling and inhibiting factors act directly to influence individual ambidexterity and which act in a mediating or moderating influence may be of value to inform firm level interventions. For this reason, deductive research that can uncover these relationships is suggested.
- The potential vicious and virtuous cycles can also be confirmed through further deductive research that seeks to identify the underlying relationship between variables.
- The negative outcomes of individual ambidexterity relate to role tension and role overload, while task variety was identified as a positive outcome and autonomy was identified as an enabling factor in individual ambidexterity. Deductive research that seeks to uncover the relationship of these positive and negative outcomes may prove valuable. Especially if a threshold can be determined beyond which the negative outcomes exceed the positive outcomes of individual ambidexterity.
- Given the reported negative outcomes it is furthermore suggested that experimental research that tests if individual ambidexterity presents any benefits over ambidextrous teams be conducted. This could inform management to what extent the pursuit of contextual ambidexterity should be drilled down to the individual level given the negative impact on employees' job satisfaction and stress.

7.9. Conclusion

Ambidexterity plays a central role in how firms adapt to market dynamics and ultimately achieve competitive advantage, prosperity and longevity. Ambidextrous individuals contribute to the endeavour to explore new market opportunities while exploiting existing capabilities and markets. Little is however published about how individuals achieve individual ambidexterity, and what the outcomes and especially negative outcomes of achieving individual ambidexterity are.

This current research contributes rich insights into how product designers in the earthmoving manufacturing industry operationalise individual ambidexterity and what the outcomes are of individual ambidexterity in this setting. Managers and knowledge are among others identified as key contributors to individual ambidexterity. The research also identified numerous opportunities that will enable a deeper understanding of individual ambidexterity. It is also expected that if stakeholders were to take heed of the reported implications higher levels of individual ambidexterity can be achieved without the reported negative consequences.

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Appendix A: Consistency matrix

Research Question	Unit of analysis	Literature review	Semi structured interview questions	Analysis
Research question 1: Establish how product designers achieve individual ambidexterity from a temporal perspective.	Individual	(Mu et al., 2020; Tempelaar & Rosenkranz, 2019)	Q2a Can you tell me how you schedule your work to accomplish both? Q3a Is it a choice between either explore or exploit or is it possible to do both at the same time?	Thematic analysis Categorisation Coding
Research question 2: Establish how product designers view individual ambidexterity from an ambidexterity balance perspective.	Individual	(Booth, 2017; Mu et al., 2020; Rosing & Zacher, 2017; Tempelaar & Rosenkranz, 2019)	Q2b Can you tell me how you allocate time between exploring and exploiting activities? Q3a Is it a choice between either explore or exploit or is it possible to do both at the same time? Q3b What do you believe are the trade-offs of exploring and exploiting at the same time?	Thematic analysis Categorisation Coding

<p>Research question 3: Establish what the factors are that enable and inhibit individual product designers' achievement of individual ambidexterity</p>	<p>Individual</p>	<p>(Caniëls et al., 2017; Mom et al., 2018; Mu et al., 2020; Swart et al., 2019; Turner et al., 2016)</p>	<p>Q4a Tell me about factors you regard as enabling your own ambidexterity? Q4b Which of the factors do you deem most dominant and why? Q5a Tell me about factors you regard as inhibiting your own ambidexterity? Q5b Which of the factors do you deem most dominant and why?</p>	<p>Thematic analysis Categorisation Coding Inferences and theory development</p>
<p>Research question 4: Establish what the perceived benefits and perceived negative outcomes are of achieving individual ambidexterity.</p>	<p>Individual</p>	<p>(Caniëls et al., 2017; Mu et al., 2020; Tempelaar & Rosenkranz, 2019; Turner et al., 2013)</p>	<p>Q6a Tell me about the positive aspects of having to explore and exploit at the same time? Q6b Tell me about the negative aspects of having to explore and exploit at the same time?</p>	<p>Thematic analysis Categorisation Coding Inferences and theory development</p>

			Q7 How does it make you feel to have to explore and exploit in a given time period?	
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Appendix B: Interview Guide

Semi-structured interview guide: Individual ambidexterity	
<p>Introduction:</p> <p>Thank you for meeting. As I already explained I am conducting research into how product designers experience and resolve the demand to work on both exploratory and exploitative activities.</p> <p>As I also explained this interview will be recorded to ensure that I am able to accurately capture everything that is discussed. I undertake to ensure all responses reported will be treated as confidential and that data will be anonymised when it is reported.</p> <p>Are you comfortable with what is meant by exploratory and exploitative activities?</p> <ul style="list-style-type: none"> • Exploration: “things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation” radical, step-wise innovation • Exploitation “includes such things as refinement, choice, production, efficiency, selection, implementation, execution”; incremental innovation <p>Individual ambidexterity is defined as “the behavioural orientation of employees towards combining exploitation and exploration related activities within a certain period of time”</p>	
1	Tell me about exploring and exploiting in your role?
2a	Can you tell me how you schedule your work to accomplish both?
2b	Can you tell me how you allocate time between exploring and exploiting activities?
3a	Is it a choice between either explore or exploit or is it possible to do both at the same time?
3b	What do you believe are the trade-offs of exploring and exploiting at the same time?
4a	Tell me about factors you regard as enabling your own ambidexterity?
4b	Which of the factors do you deem most dominant and why?
5a	Tell me about factors you regard as inhibiting your own ambidexterity?

5b	Which of the factors do you deem most dominant and why?
6a	Tell me about the positive aspects of having to explore and exploit at the same time?
6b	Tell me about the negative aspects of having to explore and exploit at the same time?
7	How does it make you feel to have to explore and exploit in a given time period?

Interview notes sheet:

Date:	Interview #:
Q1:	
Q2a:	
Q2b:	
Q3a:	
Q3b:	

Enabling	Inhibiting:
Positive:	Negative:
General:	Feel:

Interview brief and informed consent letter:

Hi [insert name],

Per the below I am conducting research on ambidexterity (demands to explore and exploit at the same time), the title of my dissertation is Individual ambidexterity in practice: The experience of product designers in the earthmoving machinery industry. It is proposed that firms secure value from current capabilities and markets through a process of incremental improvement, while at the same time exploring the disruptive type of opportunities that would unlock step wise improvements in the future. This is the essence of the term ambidexterity.

For reference I included some examples of what the terms explore and exploit captures below:

- Exploration: radical, step-wise and Innovation “things captured by terms such as search, discovery, experimentation, variation, risk taking, play, flexibility, innovation” ;
- Exploitation: incremental innovation and “includes such things as refinement, choice, production, efficiency, selection, implementation, execution”;

Your view of this and your lived experience as product designer facing these demands in a given time, in practice is the core of what I would like to learn about.

For me to include the results from this interview in my research I have to obtain your consent. By accepting this invitation I will record your consent, as stated below you are free to withdraw at any time.

Informed consent letter:

I am a student at the University of Pretoria’s Gordon Institute of Business Science and completing my research in partial fulfilment of an MBA.

I am conducting research on ambidexterity (demands to explore and exploit at the same time) and am trying to find out more about product designers’ lived experience of ambidextrous demands. Our interview is expected to last about an hour and will help us understand how to best achieve ambidexterity in the product development space.

Your participation is voluntary, and you can withdraw at any time without penalty. All data will be reported without identifiers. If you have any concerns, please contact my supervisor or me. Our details are provided below. Our details are provided below.

Researcher Name:

Halvar Rautenbach

Email:

23183935@mygibs.co.za

Phone:

+27 72 603 4014

Supervisor:

Dr Lisa Kinnear

Email:

Lisa.kinnear@twimsafrica.com

Phone:

+27 31 767 5202

Appendix C: Ethical Clearance

3/20/2021

Gordon Institute of Business Science Mail - Ethical Clearance Approved



Halvar Rautenbach <23183935@mygibs.co.za>

Ethical Clearance Approved

1 message

MastersResearch2020 <MastersResearch2020@gibs.co.za>
To: "23183935@mygibs.co.za" <23183935@mygibs.co.za>

3 November 2020 at 18:48



Ethical Clearance
Approved

Dear Halvar Rautenbach,

Please be advised that your application for Ethical Clearance has been approved.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

[Ethical Clearance Form](#)

Kind Regards

This email has been sent from an unmonitored email account. If you have any comments or concerns, please contact the GIBS Research Admin team.

EthicalClearanceReport.pdf
415K