Gordon Institute of Business Science
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Clarifying effectuation and causation: the role of regulatory focus and entrepreneurial orientation

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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.

Content

1 Cover Letter

01 December 2020

Dear GIBS Project Publish marking committee,

RE: Selection of journal motivation – Journal of Entrepreneurship

The Journal of Entrepreneurship, published by SAGE Journals, is a multidisciplinary journal that covers research publications and discourse relating to the broader field of entrepreneurship including intrapreneurship, managership, organisational behaviour, leadership, motivation, training and ethical/ moral notions guiding entrepreneurial behaviour. It has a rating of 1 according to the Charted Association of Business Schools (ABS) in 2018 and a C-rating according to the Australian Business Deans Council (ABDC) in 2019.

The Journal of Entrepreneurship is indexed by: ABDC, CABELLS Journalytics, ABS, ESCI, DeepDyve, Dutch-KB, EBSCO, EconLit, ICI, J-Gate, OCLC, Ohio, Portico, ProQuest: IBSS, SCOPUS and UGC-CARE.

The research article produced for this MBA research project heeds to the call for further clarification of the concepts of effectuation and causation within the broader entrepreneurship discourse. It does this by empirically investigating the association an individual's regulatory foci and their entrepreneurial orientation have with their preferences to apply effectual or causal logic.

Therefore, the Journal of Entrepreneurship is well suited to publish this research. Further, this article follows the guidelines and requirements set out by the journal.

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Yours sincerely,
Etienne Le Roux

2 Literature Review

2.1 Introduction

In this section the key theoretical foundations of Regulatory Focus Theory (RF or RFT), Etrepreneurial Erientation (EO), effectuation and causation are discussed. Since the objective of this study is to further clarify the concepts of effectuation and causation, a set of hypotheses as alternatives to that of Palmié et al (2019) are proposed based these theoretical foundations. These hypotheses predict the associations between RF, EO and each effectuation and causation principle.

2.2 Regulatory Focus Theory

RFT, built on the hedonic principle, was first formalised by Higgins (1997), has roots in the psychological phenomenon which suggests that people are attracted to that which causes pleasure and are deterred by that which causes pain (Higgins, 1997). RFT argues that people will regulate their strategic choices using the motivation of either a promotion focus, or a prevention focus to achieve their goals (Tumasjan & Braun, 2012). This implies, that although individuals might have similar goals, the motivation and associated behaviours are different (Johnson, Smith, Wallace, Hill, & Baron, 2015).

When applying promotion focus a person is motivated by gains and non-gains, while potential losses are not a prominent motivator towards goal attainment (Johnson, et al, 2015). A promotion focus is associated with an increased sensitivity towards positive outcomes (Palmié, et al, 2019). As such, a high promotion focus is associated with the inclination to eagerly engage new ideas and the proactive pursual of opportunities to avoid omission of potential gains (Gamache, Mcnamara, Mannor, & Johnson, 2015; Kammerlander, Burger, Fust, & Fueglistaller, 2015).

In contrast, when applying prevention focus, a person is motivated by the fear of loss and the anticipation of non-loss, thereby seeking security through avoidance of failure (Johnson, et al, 2015). As such, under prevention focus, individuals are expected to be more conservative and vigilant regarding new opportunities to avoid the risk of commitment to unsuccessful opportunities (Johnson, et al, 2015; Gamache, et al, 2015).

Importantly, Tumasjan & Braun (2012) and Johnson et al (2015) highlight the independence of the two regulatory foci, implying that individuals could utilise both foci in different combinations (Brockner, Higgins, & Low, 2004), offering insight into

how leaders combine principles such as those of effectuation and causation. Palmié et al (2019) argue that effectuation and causation principles may reflect different regulatory foci in the underlying logic applied when the principle is enacted. However, based on the findings of Tumasjan & Braun (2012), it may be argued that some principles are guided by a combination of regulatory foci and not simply a single RF.

To further support this point, Johnson (2015) states that both foci entails the pursuit of a desired end-state and the avoidance of undesired end-states. What differs between the two foci is the motivating factors that drive this pursuit and avoidance (Tumasjan & Braun, 2012). Specifically, promotion focus relies on the promise of advancement and the fear of non-fulfilment as the motivators towards achieving a desired end-state and avoiding an undesired end-state respectively (Burmeister-Lamp, Lévesque, & Schade, 2012). In a similar fashion, prevention focus relies on the motivational factors of security for approaching a desired end-state and threat for the avoidance of an undesired end-state (Burmeister-Lamp, Lévesque, & Schade, 2012).

The different motivational factors involved under promotion or prevention focus was illustrated by Markman, Baldwin, & Maddox (2005). In this experiment participants were tested in their proficiency of completing a task given different presentations of reward (presented with either a focus on gains or a focus on losses). Their study showed that participants who are primarily promotion focused achieved superior task performance when the rewards are presented with a focus on gains, while participants who are primarily prevention focussed achieved superior performance when the rewards are presented with the focus on losses. This implies that performance outcomes are substantially impacted by the alignment of rewards, or at least how rewards are positioned, with the individuals primary RF (Markman, Baldwin, & Maddox, 2005).

In addition to the possibility of situational enactment of different foci due to the independence highlighted by Tumasjan & Braun (2012), literature also debates the malleability of an individual in terms of their dominant RF (Lanaj, Chang, & Johnson, 2012). It is noted that malleability refers to an individual changing their RF as a response to contextual stimulus and should not be confused with the situational enactment as previously discussed (Tumasjan & Braun, 2012). In line with prior RF studies, such as that of Kammerlander et al (2015), the current study conceptualises RF as non-malleable.

Previous studies have found that RF significantly impacts an individual's behaviours and attitudes. Firstly, regarding change, Chernev (2004) investigated the influence of RF on a consumer's preference to change their investment fund when presented with an alternative option. In their study, it was found that participants with a high prevention focus are less inclined than participants with a high promotion focus to change their option despite being presented with alternatives that have the potential to deliver superior, but uncertain, returns. Therefore, a prevention focus implies protecting the status-quo over embracing change (Gamache, et al, 2015).

Secondly, Pollack et al (2015), found that individuals with a promotion focus are more inclined to value and actively engage in the building of and maintaining their professional business network through frequent engagement with external parties with the intention to form alliances, which they refer to as out-degree centrality.

Thirdly, in addition to its impact on an individual's attitude towards change and their networking efforts, RF also has implications for decision making that involves uncertainty (Johnson, et al, 2015). To this extent both Förster, Higgins, & Bianco (2003) and Spanjol, Tam, Qualls, & Bohlmann (2011) found, in their respective experimental studies, that promotion focussed individuals are inclined to make faster decisions and rely less on lengthy deliberation in an attempt to make accurate predictions, while prevention focussed individuals are more inclined to engage in extensive deliberation and prediction before making decisions. This is consistent with notion of vigilance towards new opportunities (Gamache, et al, 2015).

Lastly, regarding risk-tolerance, because promotion focussed individuals are motivated by the promise of advancement and the avoidance of non-fulfilment they are said to be more exert more risk-tolerant behaviour compared to prevention focussed individuals that are motivated by the promise of security and the avoidance of loss (Burmeister-Lamp, et al, 2015; Johnson, et al, 2015). To this extent Florack & Hartmann (2007) showed, that promotion focussed individuals are more likely to pursue risky investment portfolios compared to prevention focussed individuals who prefer stable portfolios. However, this risk-tolerance is also situational, with prevention foccussed individuals becoming increasingly risk-tollerent when facing accumulated losses. Under such conditions, the fear of loss drives prevention focussed individuals to make more risky decisions with the hope of erasing historic losses and regaining security (Scholer, Zou, Fujita, Stroessner, & Higgins, 2010).

In summary, RF, through its motivational power towards achieving a desired end-state and avoiding an undesirable end-state and its subsequent impact on an individual's attitude towards change, decision-making speed, risk-tollerance and their view of networking with outside parties provides a useful lense through which to evaluate individual preferences for the application of effectuation and causation principles.

2.3 Effectuation and Causation

The concept of effectuation was first introduced by Sarasvathy (2001) as a decision making heuristic embodied by expert entrepreneurs under conditions of uncertainty (Svensrud & Asvoll, 2012), such as those that exist during the creation of a new venture. Such conditions often embody Knightian uncertainty, goal ambiguity and isotropy (Sarasvathy, Dew, Read, & Wiltbank, 2008). Welter, Mauer, & Wuebker (2016) state that such conditions are not a prerequisite for effectuation, and that the concept of bounded rationality provides a more adequate prerequisite for effectual logic to emerge, implying a broader range of applicable conditions than the original framing of effectuation.

Since its introduction, effectuation has been the topic of research beyond entrepreneurial venture creation and has been applied to firm performance, internationalisation, creativity and innovation (Blauth, Mauer, & Brettel, 2014; Grégoire & Cherchem, 2019; Mthanti & Urban, 2014; McKelvie, et al, 2019). Some studies, (see for example: Brettel et al (2012); Blauth et al (2014); Dew & Sarasvathy (2016); Futterer, Schmidt, & Heidenreich (2018); Svensrud & Asvoll (2012); Szambelan & Jiang (2020) and Werhahn, Mauer, Flatten, & Brettel (2015)) have also studied effectuation in the context of large and established firms.

The corporate context differs from that of the individual entrepreneurial venture in many ways. These include the existence of a principle-agent situation where the risk exposure of the individual is somewhat separated from that of the firm as well as being less constrained by resource scarcity (da Costa & Brettel, 2011). However, despite these differences, corporate employees still face uncertainties and need to make decisions within their bounded rationality leading to entrepreneurial behaviour taking place in such settings as well (Welter, et al, 2016; (Werhahn, et al, 2015).

The relative importance non-predictive control is highlighted by Svensrud & Asvoll (2012) and Wiltbank et al (2006) who both argue that control and prediction may be

separated when concieving and executing a firms' strategy and that opportunities and innovation could be pursued in the absence of prediction with the focus more on control. The argument being that control is relatively more important than the ability to predict the future, especially when the abililty to accurately predict the future deminishes due to inherent uncertainties and therefore allocating substantial resources to such extensive planning and prediction activities potentially yields little possitive results for the firm (Sarasvathy, 2001).

In terms of its definition, effectuation is described as a means-orientated set of principles (Wiltbank, Read, Dew, & Sarasvathy, 2009). In the original interpretation, Sarasvathy (2001) refers to means orientation as a general theme, before discussing four subsequent principles: exploitation of available opportunities, control of an unpredictable future, strategic alliances and affordable loss. Some variations of these principles have been applied to subsequent studies. The most notable difference among these variations is the inclusion of the means orientated starting point as a principle by some, thereby extending the principles to five (McKelvie, et al, 2019; Werhahn, et al, 2015). In terms of quantitative research, most studies have operationalised effectuation in line with the original conceptualisation of Sarasvathy (2001), therefore treating means orientation as the general underlying theme across the four principles of experimentation, flexibility,pre-commitments and affordable loss (McKelvie, et al, 2019; Chandler, et al, 2011). This study also conceptualised effectuation in this manner.

Causation, as often contrasted with effectuation, is goal orientated (Wiltbank, et al, 2009). Under causation potential gains are maximised by embarking on extensive planning and optimisation processes (Sarasvathy, 2001). Palmié, et al, (2019) argue that this implies an increased sensitivity towards positive outcomes and embarking on elaborate planning and strategizing towards achieving these positive outcomes. While this argument accurately accounts for the goal-orientated nature of causation (Sarasvathy, 2001), it fails to account for the risk minimisation intention of planning and strategizing efforts before investment decisions are made (Chandler, et al, 2011; Futterer, Schmidt, & Heidenreich, 2018). Therefore, causation also involves an element of failure prevention (Brinckmann, Grichnik, & Kapsa, 2010; Siltaloppi & Toivonen, 2015) despite being focused on the pursuit of positive goals. On this basis, the following hypothesis are proposed:

H1a: prevention is positively associated with causation.

H1b: promotion is positively associated with causation.

The first effectuation principle, experimentation, refers to the behaviour of trial-and-error experimentation, using the means at hand, in the proactive and iterative pursuit of opportunities (Welter & Kim, 2018; Wiklund & Shepherd, 2011). Both Sarasvathy (2001) and Wiltbank, Dew, Read, & Sarasvathy (2006) argue that such an experimental approach provides a low cost means to pursue new opportunities because investments are made incrementally. Since the outcome of such experiments are not known beforehand, the motivation for such experimentation can be viewed as eagerly engaging with new possibilities and learning from failure (Brenk, Lüttgens, Diener, & Piller, 2019; Wiklund & Shepherd, 2011) without much regard for potential losses (Palmié, et al, 2019), leading to the proposal of the following hypotheses:

H2a: prevention is negatively associated with experimentation
H2b: promotion is positively associated with experimentation

The second effectuation principle, flexibility, refers to the willingness to adapt and embrace unexpected environmental events and changes not as threats but rather as potential opportunities (Chandler, et al, 2011). With this principle individuals and organisations need to quickly adapt to such contingencies, not holding on to prior plans Wiltbank et al (2006). Under this mode, the requirement for accurate long-term prediction is reduced as the firm remains adaptable to change (Sarasvathy, 2001). This principle implies that, when enacted, potential gains are sought rather than potential losses avoided (Palmié, et al, 2019). On this basis, the following hypotheses are proposed:

H3a: prevention is negatively associated with flexibility
H3b: promotion is positively associated with flexibility

The third effectuation principle, pre-commitment, relates to the attitude towards external parties who are viewed from the perspective of early stage alliances as well as possible co-creation and risk-sharing opportunities as opposed to viewing outside parties only as potential competition (Fisher, 2012; Welter & Kim, 2018). Pollack et al (2015) found evidence that RF significantly impacts an entrepreneur's view of and engagement with external networks, while Palmié, et al, (2019) argue that firms would only engage with parties that are willing to commit at an early stage. Based on

this logic, the avoidance of potential losses, as opposed to possible gains, drives the decision process. However, this argument fails to account for pre-commitments as a means of achieving shared goals while minimising the risk of non-achievement (Sarasvathy, et al, 2008). Supporting this opposing this view, Pollack et al (2015) found that entrepreneurs with a promotion focus are more inclined to value and in engage in network building activities for the purposes of advancement and the prevention of non-fulfilment. Therefore, the following hypotheses are proposed:

H4a: prevention is negatively associated with pre-commitments
H4b: promotion is positively associated with pre-commitments

The fourth effectuation principle, affordable loss, entails assessing the potential losses of the options available, and choosing the option that yields acceptable losses in the event of failure (Brettel, et al, 2012; Werhahn, et al, 2015) as opposed to assessing the expected utility or return (Wiltbank, et al, 2006). This implies a sensitivity towards potential losses, rather than gains (Palmié, et al, 2019), implying the following hypotheses:

H5a: prevention is positively associated with affordable loss
H5b: promotion is negatively associated with affordable loss

Despite academic interest, effectuation has been subject to critique and is a topic of sustained debate (McKelvie, et al, 2019). Some scholars state that effectuation falls short of being a robust theory (Kitching & Rouse, 2020), especially when using variance theory criteria (Arend, Sarooghi, & Burkemper, 2015). In response to this, Gupta, Chiles, & McMullen (2016) state that effectuation should not be considered a variance theory, but rather a process theory. However, effectuation has been applied as both a variance and process theory respectively, creating some confusion among scholars as to how it ought to be theorised (McKelvie, et al, 2019).

In the academic discourse (Arend, Sarooghi, & Burkemper, 2015; 2016; Garud & Gehman, 2016; Gupta, Chiles, & McMullen, 2016; Read et al (2016); Reuber, Fischer, & Coviello, 2016) a number of difficulties with effectuation have been highlighted. These include unexpected findings, partially attributable to differences in the underlying psychological processes involved in the application of these principles, such as negative correlations between the disparate effectuation principles, conflicting associations with some dependent variables, as well as

positive correlation with causation under certain circumstances (Futterer, et al, 2018; Mthanti & Urban, 2014; Palmié, et al, 2019). Some have argued that effectuation and causation can both be used, either simultaneously or at various decision points, and that neither is universally superior to the other (Grégoire & Cherchem, 2019; Reymen, et al., 2015; Siltaloppi & Toivonen, 2015; Smolka, et al, 2018). Therefore, the theoretical foundation of effectuation remains inconclusive and the calls to clarify the concepts of effectuation and causation remain.

2.4 Entrepreneurial Orientation

Entrepreneurial orientation (EO) is considered an important component when organisations seek to engage in entrepreneurial activities, as such, it has gathered much attention in the entrepreneurship literature (Covin & Miller, 2014; Covin & Wales, 2012; Covin & Wales, 2019). EO is often conceptualised as a firm level attribute, where firms that engage in frequent and sustained entrepreneurial activities are said to have a high EO, while firms that do not engage in entrepreneurial activities or only engage in such activities on an infrequent basis are said to have a low EO. Furthermore, this continuous variable can be assigned to any organisation irrespective of their age and size (Covin & Wales, 2012; 2019).

However, EO may manifest at different units of analysis than being solely a firm level attribute. As such, recent studies have moved the individual into focus (Covin, et al., 2020). Further, EO is not restricted to top management and executives' propensities towards innovativeness, proactiveness and risk-taking, but can manifest at any level of an organisation (Hughes, Rigtering, Covin, Bouncken, & Kraus, 2018). To this extent Hornsby, Kuratko, Shepherd, & Bott (2009), highlight the importance of middle managers in the corporate entrepreneurship process.

Despite its academic attention, and general agreement regarding the intention of EO, its construct, dimensionality and measurement remain a topic of debate (Anderson, Kreiser, Kuratko, Hornsby, & Eshima, 2014; Covin & Wales, 2012; George & Marino, 2011; Randerson, 2016). In terms of its construct, EO can be conceptualised as either formative or reflective. EO can also be operationalised as either unidimensional or multidimensional. These aspects have implications for how EO is measured (Randerson, 2016). The current study adopted the conceptualisation of EO as per Covin & Lumpkin (2011); this is consistent with Palmié et al (2019), albeit at the individual unit of analysis and not that of the firm.

Regarding the dimensions of the EO construct, Miller (1983) is often credited for first articulating the dimensions of innovativeness, risk taking and proactiveness (Covin & Wales, 2012). While other studies have introduced additional dimensions, these three core dimensions remain the most widely used (Randerson, 2016; Covin & Wales, 2019). According to Anderson (2014), the dimensions of innovativeness and pro-activeness share some overlap, while being separate from risk-taking. Based on this they argue for a reconceptualization of EO into a behavioural factor, that comprises the concepts of innovativeness and pro-activeness, and an attitudinal factor that encompasses the concept of risk-taking. This observation was also made by Szambelan & Jiang (2020). However, this reconceptualisation has not been transferred to the individual level yet. Therefore, In line with Covin et al (2020), the current study conceptualised EO according to three dimensions at the individual level as follows: 1) innovativeness as an individual's inclination to explore and experiment with novel solutions to work-based problems; 2) proactiveness as an individual's willingness to take discretionary action that creates value; and 3) risk-taking as an individual's willingness to pursue activities that have uncertain outcomes that may stem from unauthorised actions. These conceptualisations remain consistent with the original articulation of EO by Miller (1983), while bringing the individual into focus.

While many studies have focussed on the outcomes of EO (Covin & Lumpkin, 2011; Covin & Wales, 2019), such as firm performance, it is not the objective of this study to evaluate them, but rather to clarify how effectuation principles are associated with individual cognition. Therefore conceptualisation of EO at the individual level, rather than at the level of the firm is justified for the current study.

In the context of an individual's preference towards the application of causation and effectuation principles, an individual's EO is expected to have an influence on their preferred behaviour which ultimately accrues to the collective behaviour of the firm (Covin, et al., 2020).

Since causation involves extensive planning and evaluation of alternative options to optimally achieve the goals of the organisation and maximise the expected utility and return, it requires a level of innovativeness and proactive analysis of potential outcomes of various options (Sarasvathy, 2001). Further, the goal orientation implied by causation could involve high risk decisions, especially in uncertain environments where long range planning may not be accurate, implying that such extensive planning might provide a false sense of security that leads to risky decisions

(Wiltbank, Read, Dew, & Sarasvathy, 2009). Therefore, the following hypothesis are proposed:

H6a: innovativeness is positively associated with causation
H6b: proactiveness is positively associated with causation
H6c: risk-taking is positively associated with causation

Regarding the first and second effectuation principles, experimentation and flexibility, Mthanti & Urban's (2014) highlighted the importance of trail-and-error experimentation within the concepts innovativeness and proactiveness. Because the outcomes of such experiments are unknown, it implies a tolerance for risk (Palmié, et al, 2019). Similarly, embracing unexpected contingencies as opportunities also imply proactively seeking innovative solutions to emerging problems that might not have predictable results (Brettel, et al, 2012; Brinckmann, Grichnik, & Kapsa, 2010). As such, the following hypothesis are proposed:

H7a: innovativeness is positively associated with experimentation
H7b: proactiveness is positively associated with experimentation
H7c: risk-taking is positively associated with experimentation
H8a: innovativeness is positively related with flexibility
H8b: proactiveness is positively associated with flexibility
H8c: risk-taking is positively associated with flexibility

Regarding the third effectuation principle, pre-commitments, Palmié et al (2019) report that pre-commitments are negatively associated with all the EO dimensions, at least when considering EO at the firm level. Their argument is based on the notion that proactiveness serves the sole purpose of out-performing the competition through pre-emptive innovative action (Covin & Slevin, 1989). They also argue that pre-commitments might be time-consuming which detracts from a firm's innovation and proactiveness. However, this narrow view of the intention of proactiveness is not sufficient in the context of effectuation research. More specifically, the pre-commitments principle as conceptualised by Sarasvathy (2001) specifically refers to a firm's view of others as possible partners and not only competitors. To this extent, pre-commitments could also be seen as a manifestation of a firms proactiveness in partnering with others towards achieving common goals while minimising the risks involved for all parties (Chandler, et al, 2011; Dew & Sarasvathy, 2016). Therefore, the following hypothesis are proposed:

H9a: innovativeness is positively associated with pre-commitments
H9b: proactiveness is positively associated with pre-commitments
H9c: risk-taking is negatively associated with pre-commitments

Lastly, regarding the affordable loss principle, Palmié et al (2019) argue that this principle concerns itself with minimising risk exposure to a level of acceptable loss, implying that some opportunities might be foregone that could have been constituted as proactive investments. This argument is consistent with the conceptualisation of the affordable loss principle (Sarasvathy S, 2001). On this basis the following hypothesis is proposed:

H10a: innovativeness is negatively associated with affordable loss
H10b: proactiveness is negatively associated with affordable loss
H10c: risk-taking is negatively associated with affordable loss

2.5 Conclusion

Based on the theoretical foundations of RFT, EO a set of hypotheses have been proposed regarding the associations of RF and EO with each effectuation and causation principle. Using the empirical research methodology, discussed in section 3, this study investigated each of these hypotheses.

3 Methodology

3.1 Introduction

With the objective of this study to heed to the call for further clarification of the concepts of effectuation and causation, the various hypotheses presented in 0 will be tested. To this extent, this chapter discusses the methodology choice, population, sampling, unit of analysis, measurement instrument, data collection and analysis that was followed, as well as the limitations implied by following this methodology design.

3.2 Methodology choice

To meet the objective of this study, it involved the generation of findings from empirically measured variables relating to the concepts of RF, EO, effectuation and causation. As such a positivist philosophy was used (Saunders & Lewis, 2018). This is also in line with previous related studies such as Mthanti & Urban (2014); Palmié et al (2019) and Szambelan & Jiang (2020).

The hypotheses that predicted the associations between these concepts, as proposed in section 0, was based on a review of existing published literature. On this basis, the current study involved a deductive approach (Saunders & Lewis, 2018).

In addition, the current study made use of quantitative data only, which may be referred to as mono-method quantitative research. According to Creswell (2012) and Yilmaz (2013), quantitative methods involve using numerical data and relevant mathematical techniques to test theoretical relationships as predicted from literature. Since this study aimed to test such theoretical relationships between an individual's RF, their EO and their preference to apply effectuation and causation principles, this method is deemed appropriate.

Regarding the purpose of the research design, this study aimed to describe the findings from the statistical analysis as well as explain these findings using a theoretical basis of existing literature. Therefore, the purpose of the research design was discripto-explainitory (Zikmund, Babin, Carr, & Griggin, 2013)

A cross-sectional time-horizon was used in this study in order to gather the sufficient data in a cost-effective manner within the time-constraints involved in MBA research of this nature (Creswell, 2012). Other related studies have also employed a cross-sectional research design (Brettel, et al, 2012; Daveri & Parisi, 2015; Gamache, et al, 2015; Kammerlander, et al, 2015).

Further, regarding the strategy of the research, a survey strategy using a self-administered electronically distributed questionnaire was deemed appropriate for the purpose of this study as the constructs of RF, EO, effectuation and causation are observable with developed scales available in literature for all these constructs (Saunders & Lewis, 2018). Similar approached have been used in prior studies (Mthanti & Urban, 2014; Szambelan & Jiang, 2020).

3.3 Population and sample

Since the objective of this study is to determine if, within a corporate context, an individual's RF and their EO are associated with their preference to apply effectuation and causation principles, the population consists of all employees of large corporate firms who could be involved in strategic or innovation driven projects. Middle and senior managers as well as executives in such organisations are more often involved in such projects, and would therefore be in a position to give a more informed response than the broader employee base (Daveri & Parisi, 2015; Covin & Wales, 2019). Further, the population was delimited to listed entities in order to ensure the context of a corporate organisation is represented. As this population is large and opaque (all middle and senior managers employed by South African listed entities) a sampling strategy was required to obtain a representative sub-set of the population (Creswell, 2012; Wegner, 2016).

Since this study aimed to investigate the association between an individual's RF, their EO and their preferences to apply effectuation and causation, it is beyond the scope to determine the effects of industry or firm level dynamics. Therefore, the study was conducted at a single listed South African mining company. This isolated the responses from differences caused by industry or firm level dynamics (Davidson, 2004), was convenient for the researcher and was deemed appropriate because the aim of the study is to test the individual level contributions of an individual's RF and EO on their preference towards the application of effectuation and/or causation principles. It is noted, however, that this also limits the generalisability of the findings of this study. Previous related studies have also placed industry level constraints on their sample. For example, Mthanti & Urban (2014) only collected data from middle and senior managers in high-technology firms, while Palmié et al (2019) only collected data from executives of renewable energy companies.

The sample comprised middle managers, senior managers and executives who were more likely to be involved in innovation projects, and have insights into strategic level

decision making (Daveri & Parisi, 2015; Covin & Wales, 2019). This purposive sampling included 682 individuals of which 120 responses were obtained, equating to a response rate of 17.6%. The final sample, after removal of invalid or incomplete responses, comprised 113 responses. This final sample size is in line with previous related studies such as Mthanti & Urban (2014), with a sample size of 94 respondents, and Palmié et al (2019), with a sample size of 151 respondents.

3.4 Unit of analysis

The unit of analysis in a study refers to the entity being evaluated as the topic of the study and from which data is being collected (Creswell, 2012; Zikmund, et al, 2013). Therefore, for this study the unit of analysis are individual employees of large organisations holding middle and senior management positions as well as executives answering reflective questions regarding their own RF, EO and their preferences to apply effectuation and causation principles during projects that may be classified as involving corporate entrepreneurship or innovation.

3.5 Measurement Instrument

A self-administered, electronically distributed questionnaire was used as the measurement instrument for this study. Survey Monkey was used to host the online survey. This was possible because all the constructs in this study (RF, EO, effectuation and causation) are defined in literature, including the development of quantitative measurement scales (Zikmund, Babin, Carr, & Griggin, 2013).

The questionnaire consisted of three sections: 1) Declaration of consent; 2) Background information and control variables; and 3) Primary dependent and independent variables. Each of these sub-sections are discussed next.

3.5.1 Declaration of consent

The first section of the survey served the purpose to obtain voluntary consent of each participant as well as inform them of the nature of the study and their rights. Specifically, this included a clear expression that participation is voluntary and that participants may opt-out at any stage during the survey without penalty. In addition, participants were assured of anonymity and confidentiality (Saunders & Lewis, 2018).

3.5.2 Background information and control variables

The second section of the survey included a set of biographical information and control variables. These were used to screen out invalid responses that did not meet the sampling criteria, as well as serve as the basis for various exploratory data analyses. No information that could be used as personal identifiers were asked or recorded as part of this survey.

In addition to the main dependent and independent variables of this study, control variables included seniority, tenure, age, gender and previous exposure to innovation related projects. These variables allowed this study to test if the hypotheses are indeed due to the independent variables, or rather as the result of these environmental factors (Creswell, 2012).

3.5.3 Dependant and independent variables

To meet the research objectives, three sets of measurements were required. Firstly, an individual's preference towards applying the principles of effectuation and causation (dependant variables), secondly the RF dimensions, and thirdly the EO dimensions of the individual. The individual's RF and EO serves as the independent variables in this study.

Firstly, regarding the measurements related to effectuation and causation, McKelvie et al (2019), in their review of the measurement of effectuation, concludes that most recent empirical research mostly make use of two prominent survey instruments, that of Chandler et al (2011) and that of Brettel et al (2012). These two instruments differ fundamentally in that the former treats effectuation and causation as independent constructs, while the latter treats effectuation and causation as opposites along the same dimensions by using forced choice items. As this study conceptualises effectuation and causation as independent constructs and not as opposing ends of a spectrum consisting of the same dimensions, the Chandler et al (2011) instrument was used. It is also noted that the Chandler et al (2011) has been cited more frequently in empirical studies of this nature than the Brettel et al (2012) instrument according to McKelvie et al (2019).

Further, in order to measure the individual's preference towards the application of effectuation and causation principles and not the reflective perspective of the enactment of these principles within an organisation, the instrument was modified to ask respondents what they think the organisation should do, instead of reflective

questions on the current application of such principles in their organisation. The constructs of causation, experimentation, flexibility, pre-commitments and affordable loss were all assessed using 7-point bi-polar Likert scales. The original instrument of Chandler et al (2011) contained 20 items of which 13 items were retained after the PCA and CFA processes were completed. Each construct was calculated as the arithmetic mean of the retained items for that construct.

Secondly, regarding the measurement of an individual's RF, the objective was to investigate the association an individual's preference towards the usage of the disparate effectuation causation principles have with their RF combination. In the review by Johnson, Smith, Wallace, Hill, & Baron (2015) and that of Gorman et al (2012), it is highlighted that many instruments have been used to measure RF throughout various academic fields. According to Johnson et al (2015) and Gorman et al. (2012), the Regulatory Focus At Work Scale (RFAWS) by Wallace & Chen (2006) is the most adequate and widely used scale to measure RF in the context of the working environment. This measure is also consistent with the conceptualisation of RF in this study. On this basis, the RFAWS instrument is deemed an appropriate measurement of RF. The original scale contains 12 items, of which 8 were retained after the PCA and CFA processes.

Thirdly, regarding the measurement of an individual's EO, the objective was to determine the association an individual's preference to apply effectuation and causation principles have with their EO. According to Covin & Wales (2012), Covin & Miller (2014) and Covin & Wales (2019), the measurement of EO, albeit mostly at a firm level, has been the topic for many previous studies. Since this study investigates the EO at an individual level, the newly developed scale by Covin, et al (2020) was used. This scale consists of 9 items in total, 3 of which measure each dimension of EO. Of these 9 items, 5 were retained to achieve acceptable reliability and validity of the total questionnaire. Further, similar to the Szambelan & Jiang (2020) study, the items relating to innovativeness and proactiveness loaded together during the PCA. As such, these items were combined into a new single factor called Innovative-proactiveness that represented the behavioural dimension of EO while risk-taking represented the attitudinal dimension (Anderson, et al, 2014).

3.6 Data collection

With consent and the assistance of the participating organisation, an email containing a hyperlink to the online survey hosted via Survey Monkey was distributed

to qualifying employees' work email addresses. In addition to the hyperlink, the email contained an introductory paragraph clearly stating that participation is voluntary, anonymous and confidential as per the ethical clearance obtained from the Research Ethics Committee. No reminders or additional incentives for participation were provided.

Data was collected in this manner over a one-month period, after which the survey was closed. Of the 682 qualifying individuals to which the survey was distributed, 120 responses were obtained of which 113 were considered complete and valid.

3.7 Analysis approach

This section discusses the data analysis process that was followed to generate the findings of this study. This process involved: data cleaning, coding, descriptive statistics, validity, reliability, and hypotheses testing.

3.7.1 Data cleaning and coding

The first step of the data analysis process was the data cleaning and coding process, with the objective to ensure that data is transformed from its raw format into a format that is usable for further statistical analysis (Wegner, 2016).

Firstly, the raw data was downloaded from Survey Monkey in Microsoft Excel where text values were converted into their respective numerical values that correspond to one to seven on the Likert scales used in all the dependent and independent variables. No reverse coding was used in any of the scales, simplifying this process.

Secondly, the data were visually inspected for any missing values. Incomplete responses were omitted from the study.

Thirdly, the data was transferred from Microsoft Excel to IBM Statistical Package for Social Sciences (SPSS), version 26, where all variables types were checked and corrected where necessary to match the data type. All Likert scale data were treated as a continuous numerical data type (Wegner, 2016).

3.7.2 Descriptive statistics

Once the data has been transferred into SPSS, descriptive statistics were computed to gain further insights through familiarisation and exploration of the data. These

included measures of central tendency, dispersion and skewness (Wegner, 2016; Zikmund, et al, 2013).

For the measure of central tendency, both the mean and the median were computed, while dispersion was evaluated using the standard deviation and coefficient of variation. Skewness was evaluated using the skewness coefficient. Together these descriptive statistics assist in understanding how the data is shaped and distributed (Wegner, 2016).

3.7.3 Validity

Construct validity refers to how correctly a set of measures actually measure the construct they are intended to measure (Hair, Black, Babin, & Anderson, 2018). To establish construct validity, convergent, discriminant and nomological validity must be established (Hair, et al, 2018).

Convergent validity, refering to the degree of correlation between various measures that are intended to measure the same construct, is typically confirmed by evaluating the Average Varience Extracted (AVE) against the recommended benchmark of 0.5 (Hair, et al, 2018).

Discriminant validity refers to how distinct the measurements related to different concepts are (Hair, et al, 2018). In other words, is a particular item measuring only the intended construct and not some other unintended construct.

Face falidity, or nomological validity refers to the extent to which the measurements make theoretical sense (Hair, et al, 2018).

3.7.4 Principle component analysis

This study was conducted using a set of scales developed by published authors, each intended to measure specific construct. However, since these scales have not been used together in a single study, Principle Component Analysis (PCA) with an oblique Promax rotation was used to validate the measurement instrument (Weiers, 2011). The choice of rotation method was due to the fact that the constructs are expected to be correlated and not orthogonal (Hair, et al, 2018).

An iterative approach was followed, where items were removed from the total battery one by one. The deletion of items was informed by either weak factor loadings or

significant cross-loadings. Factor loadings were considered weak if they are less than 0.5 (the recommended threshold for the sample size of this study) and cross-loadings were considered significant if ratio of variance between the primary and secondary factor is below 1.5 (Hair, et al, 2018). This iterative process resulted in a final battery of 26 items that load significantly, with factor loadings between 0.541 and 0.926, onto nine unique factors explaining 78.9% of the total variance in the data. The total variance extracted was therefore above the recommended value of 50% (Hair, et al, 2018).

As part of the PCA, the Kaiser–Meyer–Olkin (KMO) measures of sampling adequacy and the Bartlett's test of sphericity was conducted. The Bartlett's test of sphericity yielded a significant chi-square value and a satisfactory Kaiser–Meyer–Olkin measures of sampling adequacy of 0.848, indicating adequacy of the PCA (Hair, et al, 2018).

3.7.5 Convergent validity

To assess the convergent valididity of the measurement instrument, the AVE was computed for each construct. AVE is defined as the avarage varience that is explained by the set of items meant to measure a construct (Hair, et al, 2018). The AVE of each construct was above the recommended threshold of 0.5 (Hair, et al, 2018). Together with the high factor loadings from the PCA, this indicated acceptable convergent validity.

3.7.6 Discriminant validity

To establish discriminant validity, the square-root of the AVE of each construct was compared to the correlation coeficient of that construct with all other constructs. According to Hair et al (2018), disriminant validity is established when the square root of the AVE of a construct is greater than the correlation coeficient with another construct. Since this was the case for the consoludated final model (after the deletion of items as part of the PCA process), discriminant validity was established.

3.7.7 Nomological validity

The nine factors extracted from the PCA correspond to the theoretical constructs of prevention, promotion, causation, experimentation, affordable loss, flexibility, pre-commitments, innovative-proactiveness and risk-taking, indicating nomological validity of the instrument (Hair, et al, 2018).

3.7.8 Confirmatory factor analysis

Since the items in the measurement instrument were obtained from literature, the items that are supposed to measure each construct was known. For this reason, and to confirm the model fit of the consolidated measurement model, a Confirmatory Factor Analysis (CFA) was performed on each scale independently, as well as together in a total model that contains all the retained items. Compared to the guideline cut-off values for $X^2/df < 3$; CFI>0.9; TLI>0.9; and RMSEA<0.08 by (Hu & Bentler, 1999), all the models, including the total model, shows adequate fit to the data.

3.7.9 Reliability

Reliability concerns itself with how consistent a construct is measured. Specifically, it provides an indication of how consistent a set of measures are in measuring the intended construct and to which degree the measure influenced by error (Hair, et al, 2018). Hair et al (2018) further highlights that even after validity has been established, it remains prudent to test the instrument's reliability.

Firstly, for each construct, the inter-item and item-to-total correlations were evaluated. The recommended threshold values by Hair et al (2018) is 0.3 for item-item correlations coeficients and 0.5 for item-to-total correlation coeficients.

Secondly, the Cronbach's Alpha value of each construct was calculated as a measure of consistancy of the items measuring that construct. The generally accepted lower bound for Cronbach's Alpha is 0.7 (Creswell, 2012; Hair, et al, 2018).

Thirdly, Contruct Reliability (CR) was computed for each construct as an addition measure of reliability. The generally accepted minimum threshold of 0.7 was used to evaluate each contruct against this measure (Hair, et al, 2018).

Taken together, these three measures indicated acceptable internal consistancy for the present study (as shown in the Results section).

3.7.10 Hypothesis tests

To test the hypothesis proposed in this study, which involved testing the association between multiple independent variables (an individual's RF and their EO dimensions) and a single dependent variable (each disparate effectuation and causation principle), multiple linear regression techniques were deemed the most appropriate statistical method (Wegner, 2016). This allowed for testing of the strength of the

associations proposed in the hypotheses. A similar approach was also used in previous studies, such as that of Mthanti & Urban (2014).

Several outputs from the multiple linear regression tests were interpreted and discussed. Firstly, the predictive power, or rather the total variance in the dependent variable that is explained by the model is illustrated by the R^2 value (Zikmund, Babin, Carr, & Griggin, 2013). In conjunction, the significance of the model's F-stat ($p<0.05$) is used to determine if the model is statistically significant (Wegner, 2016).

Secondly the beta value of each independent variable indicates the strength of the association that independent variable has with the dependent variable, while the p-value is in indicator of the statistical significance of that beta-value, where a p-value of less than 0.05 is desired as it implies statistical significance at the 5% level (Wegner, 2016). Therefore, both the beta value and its p-value were used in combination to either reject or accept the hypotheses of this study.

3.7.11 Multicollinearity

When determining associations between variables it is important to establish if the observed results are due to multicollinearity, especially when strong (exceeding 0.5) bivariate correlations are present between constructs (Hair, et al, 2018). For this purpose, the Variance Inflation Factor was calculated for all the constructs during the multiple linear regression tests and compared to the threshold of 5 given by Hair et al (2018). In addition, collinearity diagnostics were performed, calculating and comparing the condition index to the maximum threshold of 30 (Hair, et al, 2018). Based on these tests (see Results section), multicollinearity was not considered a concern for the present study.

3.8 Common Method Bias

As data was collected from single respondents using a cross-sectional survey containing reflective questions that may be influenced by item characteristics as well as the context of both the items and the total measurement, several methodological design elements were implemented to minimise the potential effect of common method bias (Podsakoff, MacKenzie, & Lee, 2003). These included a clear statement offering anonymity to the respondents, the scales that represent the dependant and independent variables were in different sections of the survey and in no consecutive order. In addition, the survey was pre-tested with academics and practitioners to confirm that all items are clear and easily understood.

Further, a Harman single factor test was conducted as recommended by Podsakoff, MacKenzie, & Lee (2003). A single factor accounted for 34% of the variance, below the threshold of 50%, indicating that common method bias is not of concern in the data of this study.

3.9 Limitations

The methodology followed in this study implied various limitations. Firstly, the limited sampling frame of this study limits its generalisability, and its findings should be interpreted with this in mind.

Secondly, this study relies on perceptual data from individual self-reflections which may be subject to cognitive biases and limitations (Robbins & Judge, 2015).

Thirdly, the cross-sectional nature of this study prevents it from concluding any causal relationships between an individual's RF, their EO and their preferences towards the application of disparate effectuation and causation principles (Saunders & Lewis, 2018).

Fourthly, this study utilised the newly developed individual EO scale by Covin, et al. (2020). In the context of this study, despite the pre-testing efforts, the items relating to innovativeness and proactiveness loaded together in our PCA, this configuration also provided the best model fit during our CFA. This limited our study in that we were required to combine these two dimensions.

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5 Appendix A: Journal Author Guidelines

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- Notes
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6 Appendix B: Example Article

Article

Corporate Entrepreneurship in the Digital Era: The Cascading Effect through Operations

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Abstract

This study examines a firm's response to perceived changes in the environment, such as the growth of the digital era, at different levels of a firm—beginning with the adoption of corporate entrepreneurship (CE) down to process renewal (PR). We further explore if the technological intensity of a firm, high-tech or low-tech intensity, influences its choice of mode for organisational renewal (OR)—use of internal competence or outside acquisition—to exploit the opportunities created by the digital era. Using survey data from 170 firms, we test a sequential relationship among environmental changes (growth of the digital era), CE, OR and finally PR that involves operating procedures at the functional level. We conclude by identifying the study's interdisciplinary contributions, which open new research avenues in the field of CE.

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Keywords

Process renewal, organisation renewal, corporate entrepreneurship, interdisciplinary research, digital era

Introduction

As rapid changes in the digital era take place due to growth in information and communication technology (ICT), successful organisations will use the context of growth in the digital era and the related advances to recreate themselves to survive and thrive in this changing environment (Doyle, 2013; Tu, Vonderembse, Ragu-Nathan, & Sharkey, 2006). Specifically, as products become smaller, perform faster and offer multifunctionality, operations managers (among others) must embrace organisational changes and consequently renew their operations, processes and systems through the adoption of innovativeness (Das & Joshi, 2007). The operational activities such as process/product development are critical to firms, but managers will need to have an entrepreneurial mindset to carry out such activities in a changing environment (Newey & Zahra, 2009).

Changes in terms of product/services offered, and customers served, are part of organisational renewal (OR), which is achieved through learning as well as creation and adoption of appropriate internal (operational) processes (Burgelman, 1991) and by changing the scope of the firm (Teng, 2007; Zahra, 1996). These changes can be accomplished by combining existing resources with new resources or new technologies with existing resources to create new products or services (Guth & Ginsberg, 1990). Therefore, it is inferred that OR is based on new ways of operating an existing business or by venturing into and managing the operations of a new business (Floyd & Lane, 2000). One of the benefits of OR is that it allows a firm to survive through changed environmental conditions (Barr, Stimpert, & Huff, 1992).

Since OR is considered essential to respond to a changing environment, it would be prudent to study this phenomenon, including its antecedents. An entrepreneurial mindset among an organisation's managers, as well as rank and file, is essential for OR (Chakravarthy & Lorange, 2008; Taylor, 2001). Among existing firms, this entrepreneurial mindset is captured by the concept of corporate entrepreneurship (CE) or entrepreneurial orientation (Joshi, 2016). CE is defined as a process that enables an existing business to create a new business within an existing organisation (Dess, Lumpkin, & McGee, 1999). A firm's adoption of CE is reflected in it being aggressive with its competitors; allowing its employees to be innovative; allowing its managers to be proactive in

responding to the environment; allowing higher levels of autonomy in the organisation; and/or inspiring risk-taking behaviour within the realm of the firm (Lumpkin & Dess, 1996).

Several researchers treat CE as an antecedent to OR (Hoy, 2006; Teng, 2007; Zahra, 1996) and observe that OR leads to the survival of a firm under changing environmental conditions (Barr et al., 1992). This leads us to infer that CE precedes OR, which, in turn, brings about changes in the organisation's products and processes. The empirical evidence to support this chain of events is, however, lacking even though the conceptual linkage is argued in the literature. Hence, there is a need to examine this relationship empirically. Further, there is a need to examine how these constructs that are well defined and understood in the field of entrepreneurship and strategy can be applied in the operations milieu.

The concepts presented above prompt us to ask two specific research questions. First, does CE indeed lead to OR? If this is true, how are they linked? Second, how can OR, a firm-level construct, be translated to the functional level, such as operations? What, if any, lessons are to be drawn from the entrepreneurship and strategic management literature that can be applied in the operations management (OM) field? To examine these questions, we draw from the entrepreneurship and strategic management literature that links environmental change and the subsequent organisational response.

This article is developed in the context of a major environmental shift that has occurred in the last two decades due to the growth of the digital era. We use spread of the Internet technology as a surrogate for growth of the digital era and examine its impact on organisations in terms of developing CE and undergoing OR. We apply a sequential approach to our research model to examine (a) if changes in the environment lead to adoption of CE in organisations, (b) if CE promotes OR, and if so by what processes and (c) does OR, in turn, have an impact on operational processes, leading to process renewal (PR).

While conceptually, the entrepreneurship and strategy literature has linked CE to OR, it seems that this linkage has been treated as a 'black box' in the literature (Joshi, Das, & Mouri, 2015). We investigate this link by examining two separate modes of OR. We assert that to achieve OR, a firm can: (a) create new internal start-ups to attain the ability to use new knowledge or technology or (b) acquire other firms to gain access to new knowledge or technology. Finally, as an exploration, we examine if this chain reaction of organisational responses emanating in response to the changes in the environment (followed by adoption of CE and adoption of OR) differs based on the technology level of these firms. Our exploration indicating our interest in examining the level of

technology is due to the fact that the impact of the spread of Internet technologies might be perceived differently by firms based on their current proficiency in technology. Figure 1 depicts our sequential model.

This study adds to the literature in the following ways. First, from a general literature perspective, it focuses on the growth of the digital era as a trigger for environmental change, linking it to the adoption of entrepreneurial behaviour (or CE) and subsequent achieving of OR. In the process, it explores the black box and proposes two different modes for firms that have adopted CE to achieve OR. The second and more critical contribution is from the OM literature perspective because we link the CE and OR to PR, an OM construct. As stated earlier, based on our literature review of the OM field, the construct PR is neither linked to OR nor CE.

The remainder of the article is organized as follows. First, we discuss environmental changes in the context of the growth of digital era that we capture through the spread of Internet technologies. Second, we examine the related literature to develop three hypotheses. Third, we provide details about the sample and methodology used in the article. Fourth, we discuss the data analysis techniques and results. Finally, we discuss these results from an academic research as well as a managerial perspective and share the implications of our results for managers.

Context: The Growth of the Digital Era

It is argued that with the advent of the Internet, growth in the ICTs, organisational functions such as marketing have been redefined and redesigned. For instance, as the Internet was adopted by commercial firms in the early 1990s, the focus was on website development for providing information about products and services to the customers and later the idea of e-commerce was introduced. In the new millennia, social media and social commerce became a key part of marketing (Leeflang, Verhoef, Dahlström, & Freundt, 2014).

Similarly, operations managers find value in adopting the ICTs (Loebbecke & Powell, 2002), because these ICTs are now crucial to managing organisational operations and improving organisational performance (Porter, 2001; Rajendran & Vivekanandan, 2008; Schlemmer & Webb, 2009). For long-term success, firms utilising ICT may need to adopt new strategies and structures to deal with changes in the environment (Ganesh, Madanmohan, Jose, & Seshadri, 2004; Joshi & Yermish, 2000). In the near future, managers and organisations will have to change their processes due to the new phase of the digital era—Internet of things (IoT)—and the growth of new platforms related

to IoT, such as the cloud-centric approach for data on demand (Gubbi, Buyya, Marusic, & Palaniswami, 2013).

Researchers have argued that as firms adopt ICTs to manage their operations, they will have to create or develop dynamic processes that focus on rapid product development and cultivate direct relationships with users, with related business strategies that require frequent partnering (Shapiro & Varian, 1998). This reformation or reorientation of strategies is necessary because the adoption of ICTs allows firms to offer new products/services (or modify their existing products/services) to their customers, as well as become more responsive to their competitive environments. Thus, with the spread of the ICTs, responsiveness to customers and proactiveness in competitive behaviour become critical components of a firm's arsenal.

By being an enabling technology, the Internet leads to transformation of firms and industries (Gopalakrishnan & Damanpour, 1997; Kathuria & Joshi, 2007). In addition to improving a firm's efficiencies, the Internet provides the ability to reduce the cost of executing transactions and internal coordination, suggesting that Internet-based commerce has a potential for continued growth (Rajendran & Vivekanandan, 2008; Schlemmer & Webb, 2009). While the Internet's importance for firms is established in the literature, only a few OM researchers have focused on the changes in the environment due to the Internet and its effect on a firm's operations (cf. Boyer & Hult, 2006; Mollenkopf, Rabinovich, Laseter, & Boyer, 2007; Rabinovich, Rungtusanatham, & Laseter, 2008). Based on our literature review, we ascertain that the adoption of CE by firms due to environmental change emanating from the growth of digital era, especially the Internet, and its subsequent linkage to OR, are research areas that are yet to be explored. In the OM literature, there is a gap in empirical findings concerning PR and OR/CE. Thus, our research focuses on the environmental context presented by the growth of digital era and the subsequent responses by organisations.

Literature Review and Hypotheses Development

Contingency Theory

Researchers have affirmed the importance of viewing the organisational adoption of CE and/or OR and its relationship with organisational performance through a contingency framework (Lumpkin & Dess, 1996).

The concept of 'alignment', 'fit', or 'consistency', is a core concept—in both the entrepreneurship and strategic management fields. It draws from the contingency theory, which postulates that to achieve 'fit', organisations will adjust their structure and processes to align with their environment (Donaldson, 2001; Joshi, Kathuria, & Porth, 2003). Specifically, when firms facing a changed environment align organisational processes, systems or scope to the changed environment by adopting highly innovative, risk-taking and proactive approaches in their organisations, their performance improves (Naman & Slevin, 1993).

Changes in the Environment and Corporate Entrepreneurship

To remain competitive, firms operating in a blustery environment need to engage in environmental scanning to spot a change and then exploit it to their benefit. Milliken (1990) suggests that managers carry out three tasks related to 'sense-making' in a changing environment. The first task is scanning, wherein managers must scrutinize their environment to recognize anticipated or realized changes in it. The second task is interpretation; the manager must analyse and understand the scanned information and interpret the changes and its likely causes on the organisation. The third task is action; based on sense-making and interpretations of the changed environment, managers must execute relevant actions to respond to these changes. Thus, we assert that monitoring environmental change would allow a firm to be proactive and convert a potential threat into a potential opportunity (Barringer & Bluedorn, 1999).

At times, perception of changes in the environment (i.e., subjective interpretations) influences managerial behaviour (Schneider & De Meyer, 1991; Thomas & McDaniel, 1990). The survival may be at stake unless the organisation adapts to changes in its environment. Therefore, as the perception of environmental change is established, organisations change their structure, strategy and processes (Danneels, 2002; Veenker, Sijde, During, & Nijhof, 2008). That is, they become entrepreneurial as they face increased global competition or experience technological changes in the environment (Chakravarthy & Lorange, 2008). Similarly, Zahra (1993) observed that firms embraced CE when they perceived their environment to be dynamic. Firms that adopted e-commerce were more likely to identify the Internet as an originator of new opportunities and as such were more proactive to exploit the opportunities (Ramsey &

McCole, 2005). Proactiveness is expected of firms adopting CE (Lumpkin & Dess, 1996).

When examining environmental changes in relation to technology, a careful assessment of technological changes leading to a changed environment becomes critical as explained by Das and Joshi (2012). This is because established firms are likely to be victimized by 'familiarity' and 'maturity' traps (Ahuja & Lampert, 2001) with regard to their response (or lack of it) to these changes. These traps, however, can be overcome by exploring and experimenting with novel, emerging and pioneering ideas (Ahuja & Lampert, 2001), thus leading to an entrepreneurial mindset within the organisation. Thus:

H1: Firms that perceive a higher level of change in their industry environment are more likely to adopt corporate entrepreneurship to exploit the opportunities afforded by the growth of digital era.

Corporate Entrepreneurship and Organisational Renewal

Changes in organisational scope and processes constitute a part of OR (Burgelman, 1991; Teng 2007; Zahra, 1996). Typically changes in scope are accomplished by recombining existing resources with new resources (Guth & Ginsberg, 1990) or new knowledge (Floyd & Lane, 2000), such as adoption of Internet technologies (Joshi & Yermish, 2000). Therefore, the underlying focal points of OR become new ways of operating an existing business or venturing into and managing the operations of a new business.

Understanding changes in the environment that leads to the adoption of CE helps a firm identify new opportunities. This, in turn, allows a firm to reorient its corporate focus (Bhardwaj, Camillus, & Hounshell, 2006) by offering new products/services, operating in new geographic markets or identifying a new set of customers (Joshi, 2016). However, there is a scarcity of research focusing on the adoption of CE by firms as a response to environmental changes and its effect on OR. We emphasise that the process of understanding and monitoring environmental change, and the subsequent identification of a threat or an opportunity, leads to a reshaping of the long-term orientation (missions and goals) of a firm. This reorientation in turn reshapes the products/services offered as well as

the customers served. Our assertion is aptly supported in the two examples of Nokia and Wipro—both firms evolved from agriculture-based products to technological products and services (Bhardwaj et al., 2006).

Thus, to attain OR in a firm, one must examine its new set of customers, new offerings of products/services and new markets or geographical regions in which it operates. The heterogeneity of productive resources available to a firm forms the basis for developing specialized knowledge that can widen business opportunities and thus provide competitive advantage to the corporation. As per the resource-based view (RBV) of the firm, established organisations have two alternatives to build their knowledge base (a source of competitive advantage), internal investments or external acquisitions (Cohen & Levinthal, 1990). Both these alternatives enable organisations to shape new capabilities, which, in turn, permit it to compete in a changing environment (Eisenhardt & Martin, 2000).

Applying the RBV perspective, we argue that CE is an approach for acquiring, processing and leveraging resources for competitiveness. CE provides changes in the organisation that in turn either rejuvenate or redefine (or both) a firm that is facing a changed environment (Dess et al., 2003). The process of CE, and a firm's focus on internal or external venture creation (Sharma & Chrisman, 1999), may lead to development or acquisition of new resources (Kazanjian, Drazin, & Glynn, 2001) or repositioning of existing resources through reconfiguration and modification (Dess et al., 2003).

Using the RBV arguments for development of new competencies, new start-ups by existing firms could be either internally or externally focused. For instance, in the early days of the growth of the Internet, to respond to the growth of Amazon.com, Barnes & Noble created Barnesandnoble.com, which was entirely internal and under its direct ownership. On the other hand, in the early days of personal computing, IBM launched their PC division in response to Apple, by creating an autonomous division far away from its headquarters in New York. In both these instances, internal or external ventures, the firms maintained direct control when creating the new venture. Alternative resources (and subsequently competitive advantages) are gained when firms acquire innovative start-ups in their industries. In the present article, the measurement of OR or change in the scope of operations of the firm, the key issue to focus on, relates to the choice of the mode of renewal—either by building internal competencies or by acquiring external ones. Due to the rapid advancement of the digital era, the chosen path (internal or

external) must allow a firm to change its scope of operations quickly and successfully.

Strategy research suggests that firms find it difficult to embrace new technologies because they are unable to obtain key assets, both physical and human (Holbrook, Cohen, Hounshell, & Klepper, 2000; Leonard-Barton, 1994). If the core competencies needed for organisational change are radically different from the current resource base of the firm, then the firm is likely to engage in an external business undertaking (Nagarajan & Mitchell, 1998). For example, breakthrough inventions have necessitated firms to go past local hunt to explore new, emerging and groundbreaking technologies (Ahuja & Lampert, 2001). Time, or speed of response, becomes of essence because the firms expect to see the implementation and results quickly, as in the case of DuPont when it moved into Organic Chemistry (Bhardwaj et al., 2006).

It must be noted that because of adopting CE to create new products and/or services, the level of entrepreneurial activity is likely to be dependent on firms' capabilities (Helfat & Peteraf, 2003). However, developing a capability in new or emerging technology demands time and capital if the established firms lack such knowledge (Dosi, 1988). In such events, it is likely that focal firms may acquire target firms to absorb the new skill sets to respond to the changed environment. This dependence on outside resources (by way of acquisitions) would allow them to better understand and absorb the new phenomenon (Ahuja & Katila, 2001) or create innovations (Stuart & Podolny, 1996).

Researchers have suggested that firms differ in their resource set to develop new capabilities because this process is path dependent, and over time the choice of the initial path leads to persistent differences between firms (Holbrook et al., 2000; Raff, 2000). Hence given their existing set of capabilities and the extent of severity of environmental changes, firms will either create new internal start-ups or acquire firms to achieve OR. Thus, in the context of growth of the Internet:

H2a. The adoption of CE is positively related to the use of new start-ups by existing firms. Additionally, the use of new start-ups is positively related to OR.

H2b. The adoption of CE is positively related to the use of acquisitions by existing firms. In addition, the use of acquisitions is positively related to OR.

Linking Organisational Renewal to Process Renewal

While the strategy literature has focused quite extensively on the topic of renewal, the OM literature has not addressed this topic in depth. Our aim is to address this gap in the OM field by our present research. We derive the basic concepts of renewal from entrepreneurship and strategy literature to further the idea of renewal at the operational level. Because renewal is an evolutionary activity and may require acquisition and use of new information (Floyd & Lane, 2000), we build arguments to support that OR is associated with renewal of operational processes, which we term 'process renewal'. We contend that OR can be translated at the functional (operations) level as renewal of operational processes when firms use new knowledge and innovative behaviour for improving or finding new ways of performing operations.

Our assertion is based on the model proposed by Roth and Menor (2003) that focused on delivery systems in service firms. This model suggests that strategic design choices based on structural, infrastructural and integration approaches lead to a delivery system. Further, their model focuses on three activities related to delivery systems that eventually lead to value for customers. These include service execution, assessment of gaps in services and service renewal (Roth & Menor, 2003). As renewal of the delivery system is essential for firms striving for world-class operations (Roth & Menor, 2003), we address this specific gap in the literature.

The concept of OR in the strategy literature matches the OM issue of renewal of the processes. Both are compatible and meaningful to the OM field, since renewal of processes is a phenomenon of interest to OM. Finally, the underlying assumption in the strategy area that OR leads to a competitive advantage (Teng, 2007) matches the underlying assumption that PR permits the operations function to contribute to a firm's competitive advantage, as attested by other OM researchers (Hayes, Pisano, Upton, & Wheelwright, 2005).

Thus, while affirming the value of good execution and continuous assessment of gaps, we argue that in a rapidly changing environment caused by the growth of the digital era, especially an evolving and fast-moving technology such as the Internet, firms must continuously renew their processes to remain aligned with changing organisational objectives. Further, Newey and Zahra (2009) have observed that operational activities such as process/product development are critical to firms, but managers must have an entrepreneurial mindset to carry out such

activities in a changing environment. In the present study, the organisational objectives are adoption of CE, due to changes in the environment, and renewal of the organisation, by way of new product/service offerings, customers served and geographic scope.

Such an OR would prompt changes at the operational level, including changes in systems, business processes and operating procedures. If the OR is not followed by a PR, then firms may face certain opportunity costs (Li & Rajagopalan, 2008). The consequences of not extending the entrepreneurial activity to the operational level, by way of PR, have also been underscored by Knight (1989) and MacMillan, Block, and Narasimha (1986). Thus:

H3: Organisational renewal is positively associated with process renewal.

Research Methods

Sample

We are interested in examining the relationships of changes in the business environment due to the growth of the digital era and the adoption of CE that lead to OR. This renewal may be achieved via two different modes. We assert that regardless of the mode used, eventually, OR will spur PR. To test our hypotheses, we collected survey-based data. A questionnaire was mailed to top managers of 1,100 firms. After two follow-ups, we received 173 responses, of which 170 were usable. The remaining three responses were unusable because of missing data. A majority (55%) of the survey respondents were at a senior level, such as an owner, CEO or CFO, where firm-wide decisions could be made. The average respondent for this survey was 43 years old with over 20 years of experience at work. Twenty-six per cent of the respondents were females, and thirty-six per cent had a graduate degree. The data were collected from the mid-Atlantic region of the USA using the membership of Eastern Technology Council (ETC). Employing such a targeted and narrow approach is consistent with research in management when total population is inaccessible (cf. Parkhe, 1993).

Variables and Measures

The data collection was conducted with a questionnaire (refer Appendix A). With our study's focus on the downstream effects of technological change,

all the variables were measured in the overall context of growth of the Internet. By explicitly stating this context, we hoped to reduce (if not exclude) alternative explanations for the strength of the relationships in our proposed model. The variable 'BUSINESS ENVIRONMENT' was created with a four-item scale to assess perceived changes in the industry environment of the responding firm. The objective was to assess changes in the environment due to the growth of the digital era, especially that of the Internet, as perceived by the respondents. The variable 'CORPORATE ENTREPRENEURSHIP' which is the likelihood of a firm adopting CE was measured using a five-item scale (please refer Appendix A). The five items were based on the five dimensions of entrepreneurial orientation as in Lumpkin and Dess (1996). The variable 'ORGANISATIONAL RENEWAL' was obtained using a four-item scale. The focus of the items was whether changes in the environment due to the Internet altered the firm's offerings of products, services, customers and markets. The 'MODES OF ORGANISATIONAL RENEWAL' was operationalized by asking the respondents if their businesses were likely to acquire an Internet firm or acquire a competitor actively involved in the use of Internet technologies. Additionally, respondents were asked if their businesses wanted to create new start-ups to exploit the opportunities afforded by the Internet. Finally, 'PROCESS RENEWAL' used the description of PR from operations-related concepts, and a three-item scale was used. The focus of the items was whether changes in the environment due to the Internet altered the firm's business processes, operating systems and operating procedures.

Threat of Common Method Variance and Mono-respondent Bias

We tried to overcome the potential of such biases by collecting data from key informants. The use of high-ranking officials (CEOs, senior VPs, etc.) helps moderate the problem of mono-respondent bias, as they are more likely to provide reliable information concerning the strategic issues faced by the firm (Kathuria, 2000).

We also followed some procedural and statistical remedies to reduce the mono-method bias. For instance, while designing the survey, we provided a separation in the instrument by stating that we were simply interested in their firm's behaviour, rather than any connection between environment change and adoption of CE and growth strategies. Further, we promised and kept anonymity of the respondents.

We further conducted some post-hoc and statistical remedies to deal with the issues of artificial covariance. For example, we used the Harman (1967) test, as done in recent management studies (cf. Kathuria & Davis, 2001), to test for the incidence of common method variance (CMV). Second, we conducted *t*-tests and found no significant differences between the first sets of respondents and late respondents. Thus, we checked and mitigated the effects of non-response bias, if any.

Analysis and Results

Measurement Model and Reliability Analysis

We considered three measures in evaluating convergent validity. All standardized factor loadings on their respective constructs were acceptable (≥ 0.50) and significant ($t > 2$). We present these results in Table 1. The composite reliabilities of scales were all greater than 0.70, as shown in Table 2. The average variance extracted (AVE) was above the critical value of 0.5 for all constructs.

The correlations between the constructs are shown in Table 3. We tested for the discriminant validity by comparing the square of the correlations between two constructs to AVE. All tests were supportive.

Structural Model and Test of Hypotheses

A partial least square (PLS) latent path approach is used to estimate the path model in Figure 2. Our six latent variables are modelled in the reflective mode. For example, CE is reflected by the five indicator items shown in Appendix A.

To test the study hypotheses, we used standardized path coefficients as in Table 4. These coefficients are indicative of the strength of relationships between constructs. These are displayed in Table 4, along with the *t*-values of the path coefficients and their significance levels. In Table 5, we report the amount of variance explained (R^2) for the dependent constructs.

The intent of this research was to examine a sequential relationship that shows progression from the adoption of CE to subsequent adoption in changes of processes at the operational level. Hypothesis 1 proposed that in the context of growth of the digital era, when firms perceive change in their business environment, they will adopt CE to exploit the opportunities afforded by the changes in the environment. This

Table 1. Factor Loadings and Cross-Loadings

Scale Items	Organisation Renewal	Corporate Entrepreneurship	New Start-ups	New Acquisitions	Process Renewal	Environment
OrgRen-1	**0.7958**	0.5137	0.3426	0.3647	0.4341	0.3899
OrgRen-2	**0.8648**	0.5722	0.3102	0.3815	0.5035	0.4588
OrgRen-3	**0.8111**	0.5130	0.2830	0.3503	0.4410	0.5090
OrgRen-4	**0.8101**	0.5538	0.2578	0.3345	0.5457	0.4228
CE-1	0.6128	**0.8534**	0.3115	0.3676	0.5896	0.5198
CE-2	0.5563	**0.8596**	0.3750	0.3858	0.4979	0.3881
CE-3	0.5701	**0.8545**	0.2604	0.3404	0.4497	0.4487
CE-4	0.5221	**0.8807**	0.2865	0.3036	0.5167	0.4443
CE-5	0.4671	**0.7307**	0.3292	0.4226	0.4401	0.3288
NewStr-1	0.3662	0.3492	**0.8551**	0.3701	0.2910	0.1745
NewStr-2	0.2515	0.2810	**0.8547**	0.5014	0.2348	0.2316
NewAcq-1	0.3498	0.3592	0.5302	**0.9235**	0.3873	0.2870
NewAcq-2	0.4552	0.4385	0.4042	**0.9227**	0.4077	0.3476
Proc Ren-1	0.5375	0.5267	0.2800	0.3606	**0.9012**	0.5263
Proc Ren-2	0.5150	0.5300	0.3335	0.3989	**0.9175**	0.5170
Proc Ren-3	0.5632	0.5873	0.2340	0.4128	**0.9305**	0.5692
Env-1	0.5178	0.5075	0.2564	0.2963	0.6149	**0.8863**
Env-2	0.4453	0.4255	0.1815	0.2865	0.4561	**0.8800**
Env-3	0.3802	0.3080	0.1648	0.3008	0.3228	**0.7182**
Env-4	0.4481	0.4305	0.1792	0.2511	0.5072	**0.8061**

Source: The authors.

Table 2. Descriptive Statistics and Reliability Measures

Construct	Mean	Standard Deviation	Composite Reliability	AVE
Organisational renewal	4.223	2.094	0.890014	0.669432
Corporate entrepreneurship	4.604	1.605	0.919341	0.695946
New start-ups	2.461	1.855	0.842326	0.727602
New acquisitions	2.461	1.769	0.917274	0.84719
Process renewal	4.794	1.776	0.938445	0.8356
Environment	5.380	1.393	0.892641	0.676661

Source: The authors.

relationship was positive and significant, based on the path loading ($b = 0.515$, $t = 8.673$ and $p < 0.000$). The results in Figure 2 support our contention that a firm's drive/desire to become more entrepreneurial is related with perceived changes in their business environment associated with the growth of the digital era. Thus, Hypothesis 1 was supported.

The linkage between adoption of CE and OR was examined by Hypothesis 2. We argued and expected that the firms adopting CE will show OR by way of new customers or new products and services. We further contended that this could be achieved via two separate modes. Hence, Hypothesis 2 was tested for each path. Hypothesis 2a tested the path that focused on internal start-ups (exploiting internal competencies) and Hypothesis 2b focused on acquisitions by way of assimilating competencies from external sources. The paths from CE to adoption of internal start-ups ($b = 0.375$, $t = 6.166$ and $p < 0.000$) and adoption of internal start-ups to OR ($b = 0.203$, $t = 3.076$ and $p < 0.005$) were both significant. This supported Hypothesis H2a. Similarly, the paths from CE to acquisitions ($b = 0.439$, $t = 7.116$ and $p < 0.000$) and from acquisitions to OR ($b = 0.343$, $t = 4.959$ and $p < 0.000$) were supported. Hypothesis H3 predicted a positive relationship between OR and PR, and that path was also significant ($b = 0.588$, $t = 9.411$ and $p < 0.000$). Hence H3 was also supported.

Exploratory Data Analysis: The Role of Level of Technology

With our focus on the downstream effects of technological change, resulting in a significant shift in the firm's business environment, we

Table 3. Correlations of Constructs

	Organisation Renewal	Corporate Entrepreneurship	New Start-ups	New Acquisitions	Process Renewal	Environment
Organisational renewal	1					
Corporate entrepreneurship	0.652	1				
New start-ups	0.361	0.367	1			
New acquisitions	0.435	0.431	0.505	1		
Process renewal	0.586	0.596	0.305	0.426	1	
Environment	0.541	0.509	0.236	0.342	0.582	1

Source: The authors.

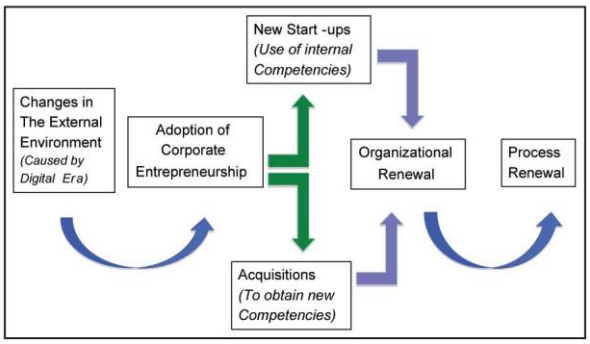

Figure 1. Sequential Model of Adoption of Corporate Entrepreneurship Leading to Organisational and Process Renewal

Source: The authors.

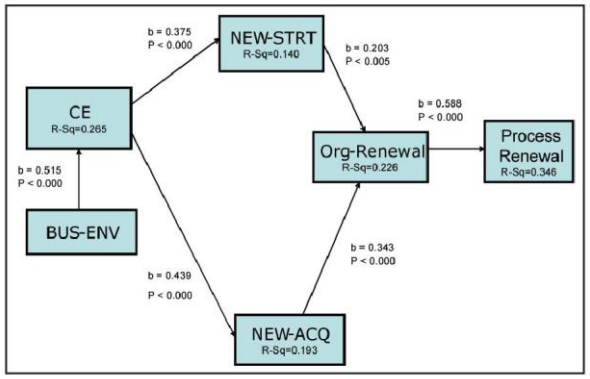

Figure 2. Linking Corporate Entrepreneurship to Organisational and Process Renewal in All Firms (n = 170)

Source: The authors.

wanted to explore if the technology level of a firm may differentiate their adoption of CE with a concomitant effect on OR and PR. We asked our respondents to assess the technology level of their firm's primary industry in which they competed (details in the next section). For convenience, we consider firms as 'high tech', when competing primarily in an industry that is assessed as being 'high technology', and as 'low tech' when competing primarily in an industry that is not assessed as being 'high technology'.

Table 4. Path Coefficients and Significance Levels for the Model

Path	Path Coefficient	*T*-Value	Hypotheses
From changes in the environment to corporate entrepreneurship	0.515	8.673 ($p < 0.000$)	H1 Supported
From corporate entrepreneurship to internal start-ups	0.375	6.165 ($p < 0.000$)	H2a Supported
From new start-ups to organisational renewal	0.203	3.076 ($p < 0.005$)	H2a Supported
From corporate entrepreneurship to acquisitions	0.439	7.116 ($p < 0.000$)	H2b Supported
From acquisitions to organisational renewal	0.343	4.959 ($p < 0.000$)	H2b Supported
From organisational renewal to process renewal	0.588	9.411 ($p < 0.000$)	H3 Supported

Source: The authors.

Table 5. Variance Explained

Dependent Construct	R^2
Corporate entrepreneurship	0.265
New start-ups	0.140
New acquisitions	0.193
Organisational renewal	0.226
Process renewal	0.346

Source: The authors.

Since cognitive constraints affect managers' perceptions of the environment and subsequent actions by a firm (Stopford & Baden-Fuller, 1994), it is likely that high-tech and low-tech firms may respond differently to environmental changes caused by the growth of the digital era. A firm identified as high tech would use a higher level of theoretical and practical knowledge as compared to a firm labelled as low tech to conceptualize, develop, create and deliver its products/services. In other words, for a high-tech firm it would be necessary to seek higher levels of knowledge, skills and artefacts in its inputs, outputs and processes as compared to a low-tech firm. Perceptions play a critical role in the

environmental sense-making process (Volberda, Baden-Fuller, & Bosch, 2001). Therefore, managers in high-tech service firms may perceive the environment, from which they derive and apply technology-driven knowledge, quite differently compared to those managers who work in low-tech firms. If high-tech firms are likely to perceive higher levels of changes in their environment, then they are also likely to become more entrepreneurial as compared to low-tech firms that do not share the same perception (Kuratko, Ireland, & Hornsby, 2001).

Empirically, environmental turbulence has been found to have a substantial causal impact on the levels of entrepreneurial behaviour in a firm (cf. Davis, Morris, & Allen, 1991). These changes towards adoption of entrepreneurial behaviour, and subsequently in the scope of the firm, due to perceived turbulence in the environment, would allow firms to explore products/services tailored to its new customer set (Bitner, Ostorm, & Meuter, 2002). Firms with a business domain dominated by high technology can find an opportunity as technology changes rapidly, because their services are now available to a larger variety of customers through new channels or modified delivery mechanisms. While changes due to the growth of the digital era may offer many opportunities, it may present some negative aspects too. For instance, rapidly changing technologies may lead products and services to have shorter life cycles, potential for cannibalistic actions and higher levels of incidences of obsolescence (Harpaz & Meshoulam, 1997; Song & Montoya-Weiss, 2001). Specifically, about the Internet, many rules of business regarding customer behaviour, competitors as well as the internal processes of a firm may change (Boyer, 2001; Joshi & Yermish, 2000). In addition, based on RBV arguments, if top managers of high-tech firms perceive that the competencies for a new venture due to the growth of the digital era are similar and complementary to the resources housed in the firm, then it is likely that they will favour an internal start-up vis-a-vis an external venture (Nagarajan & Mitchell, 1998). Managers might consider overcoming obstacles in developing internal ventures by being entrepreneurial. Thus:

Exploratory Proposition 1: *For hi-tech firms adopting corporate entrepreneurship, the use of start-ups and the presence of organisational renewal are positively related.*

For low-tech firms, however, the growth of the digital era may create resource acquisition challenges because their current resource base might be too far from the new technology needs that arise from such

growth. Therefore, adoption of Internet technologies might be more of a breakthrough event for low-tech firms when compared to high-tech firms. Ahuja and Lampert (2001) found that firms facing these breakthrough inventions need to explore new, emerging and ground-breaking technologies. Due to the rapid growth of the digital era, the choice between new internal start-ups or external acquisition would depend upon the need for the firm to quickly and successfully adopt new technology and change its business scope. Hence, low-tech firms lacking basic technological building blocks may find the absorption of new technology to be challenging (Holbrook et al., 2000).

If a change in the environment requires drastically different competencies compared to the current resources available in the firm, then managers might favour an external venture (Nagarajan & Mitchell, 1998). Since high-tech firms may have the necessary human skills and flexibility due to higher-level needs for knowledge to manage their business domain (Song & Montoya-Weiss, 2001), they might be more comfortable with internal ventures. On the other hand, low-tech service firms may find that pursuing internal ventures can delay their chances to exploit the opportunities afforded by the change, as this path might be too slow given their current resource base for new breakthrough inventions as explained by Ahuja and Lampert (2001). At the same time competitively, they may be disadvantaged if they do not respond with speed by not adopting the new technology fast enough (Bhardwaj et al., 2006). This may lead to them favouring the use of new acquisitions for OR. Thus:

Exploratory Proposition 2: *For lo-tech firms adopting corporate entrepreneurship, the use of acquisitions and organisational renewal are positively related.*

Measures of High- and Low-Technology Firms (For Exploratory Analysis Only)

A questionnaire item was used (please see Appendix A) to assess whether the primary industry in which the firm competes is considered a high-technology industry, with a 7-point Likert scale, where 1 is a complete disagreement with the statement and 7 a complete agreement. Firms responding with either 1, 2 or 3 on that scale were considered in a low-tech industry, whereas those indicating a high level of agreement (5, 6 or 7) were in a high-tech industry. Fourteen firms with a response in the

middle (midpoint 4) were dropped from exploratory analysis. Using this approach, we received 54 firms identifying themselves as low-tech service firms and 102 as high-tech firms.

In our exploratory analysis, we find that both propositions were partially supported. We had argued that in high-tech firms, start-ups were related to OR, whereas in low-tech firms, acquisitions were related to OR. The results (see Figures 3 and 4) show that in both high-tech and low-tech firms, acquisitions were significantly related to OR ($b = 0.313$, $p < 0.00$ and $b = 0.395$ and $p < 0.025$ respectively). Though as per our arguments, internal start-ups in high-tech firms were related to OR ($b = 0.198$, $p < 0.025$), interestingly, the relationship between acquisitions and OR was stronger than that between new internal start-ups and OR in these firms. No relationship was found between new start-ups and OR in low-tech firms. Finally, the relationship between OR and PR was stronger in low tech than in high-tech firms. These results are discussed further in the following section.

Discussion, Implications and Conclusion

Discussion of Results

Our results affirm earlier findings in the literature about changes in a firm's external environment (cf. Chattopadhyay, Glick, & Huber, 2001;

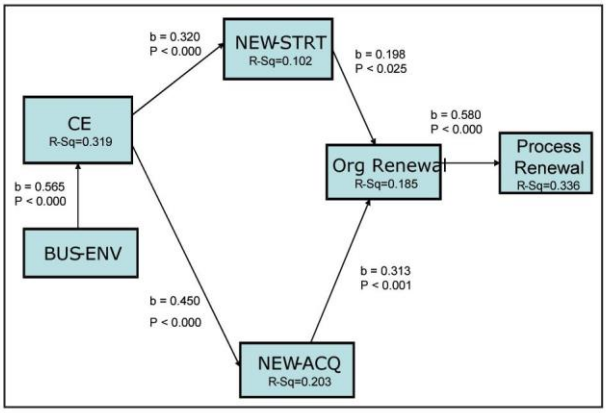

Figure 3. Linking Corporate Entrepreneurship to Organisational and Process Renewal in High-tech Firms ($n = 102$)

Source: The authors.

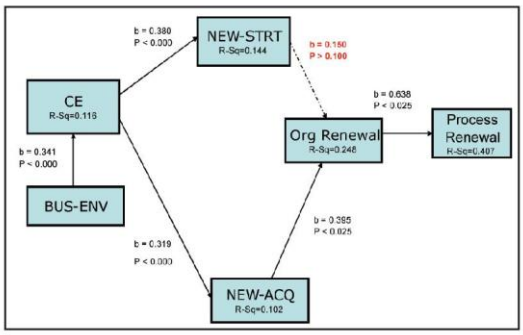

Figure 4. Linking Corporate Entrepreneurship to Organisational and Process Renewal in Low-tech Firms (n = 56)

Source: The authors.

Joshi, 2016), that to survive and thrive, firms need to adapt to these changes. Specifically, our study examines how firms respond to changes in the external environment due to the growth of the digital era. Our research also goes a step further and examines the process of responding to these changes at the functional (operations) level, by proposing and testing a sequential model linking the assessment of environmental changes all the way to changes in operational processes.

Our analysis finds support for all hypotheses and some of our exploratory propositions, summarized in Table 4. We find support for our hypothesis that changes in the business environment due to growth of the digital era are related to the adoption of CE. Further, CE is related to OR by two different modes—internal start-ups and acquisitions. Finally, OR is related to PR. Based on the 'explained variance' of each of the stages, we show that our results are robust with R^2 varying from 14 to 35 per cent (see Table 5), with the corresponding hypothesized paths being significant.

In our exploratory analysis, we found that firms differ in their emphasis on the choice of mode leading to OR based on their technological orientation: high-tech versus low-tech firms. While in both high-tech and low-tech firms acquisitions are related to OR, we find that only in high-tech firms new start-ups are related to OR.

Implications, Contributions and Future Directions

Based on our findings, we assert that academic implications of this study are multifold. First, we have linked a corporate-level construct from

'adoption of corporate entrepreneurship (CE)' to 'organisational renewal (OR).' More importantly, we link OR to an operational-level construct, 'process renewal'. Our findings are also consistent with contingency theorists, who suggest that firms need to make changes at all organisational levels to achieve an alignment with the external environment (Donaldson, 2001; Jain, Ramamurthy, Ryu, & Yasai-Ardekani, 1998; Joshi, Kathuria, & Porth, 2003; Venkatraman, 1989).

Second, we are opening new research frontiers by building linkages between CE and OM. Research on the interface between OM and entrepreneurship in general (and OM and CE in particular) is at a nascent stage, and our research pushes it forward. Our sequential model with environmental changes leading all the way to PR can be viewed as a link between OM and new venture creation, supporting Ireland and Webb's (2007) work that links entrepreneurship across many disciplines.

Third, we have empirically examined the 'black-box' nature of the relationships among constructs like environmental change and organisational processes (Joshi, Das, & Mouri, 2015). Further, in examining this black box, we applied an integrative approach by drawing from the field of CE, strategic management and OM. As stated earlier, in examining the concepts of CE and OR (from entrepreneurship and strategy literature), we have adhered to Amundson's (1998) criteria for importing concepts from other fields.

The study's results also have implications for managers. They help managers understand why corporations need to adopt CE to achieve OR, and that in turn may lead to PR for a firm's long-term survival in an ever-changing business environment. Based on our findings, managers may want to monitor, predict or anticipate other technologies that are new on the horizon and respond accordingly by allocating resources that would enable them to adopt new technology via internal start-ups as well as external acquisitions.

Our results suggest that operations managers may need to be proactive when they notice that the corporate team is facing the challenges of environmental change. Specifically, operations managers may prepare to initiate changes in processes to meet the revised corporate objectives that may ensue. Further, operations managers may prepare for these changes based on whether the firm is pursuing internal development or external acquisition of technology.

Based on our exploratory results about a firm's technology level, our findings suggest that managers of firms primarily in low-tech industries may want to pay specific attention to changes in their external environment and monitor organisational responses proactively. Since our

findings indicate that low-tech firms tend to engage in external technology acquisitions, being prepared to change processes to absorb new technology from external sources becomes critical for managers. On the other hand, managers from firms, primarily in high-tech industries, must cope with *simultaneous* internal development of products and services and the acquisition of firms that may allow them to cope with fast-changing, new technologies such as ICT that may require adjustments to corporate objectives as well as operational processes.

This study has limitations that present opportunities for future researchers. First, the high-tech and low-tech classification used in our exploratory analysis is based on respondents' self-assessments on a single-item measure. Future research should aim at developing multiple-item scales for the purpose. Second, each of the five dimensions of entrepreneurial orientation can be further developed and operationalized through multiple items.

Conclusion

This research set out to examine the adoption of CE by a firm as well as the adoption of a set of responses constituting OR and PR to cope with changes in the environment due to the growth of the digital era. We further ascertained the likelihood of high-tech firms behaving differently from low-tech firms in their approaches to exploiting opportunities afforded by such changes in the environment. We found that in the context of the growth of the digital era, positing and testing a sequential relationship between environmental changes, adoption of CE, achieving OR and finally PR helps in understanding the interface between entrepreneurship and the operations function of a firm.

Appendix A

Questionnaire Items

1. **Environmental change**
   The impact of growth in the Internet on:
   (Scale: 1—very low; 7—extremely high)

   - your firm
   - your competitors

- your suppliers
- your customers

2. **Corporate entrepreneurship (CE)**
   To exploit the opportunities afforded by the Internet is your firm likely to:
   (Scale: 1—not likely at all; 7—extremely likely)

   - become more innovative
   - become more risk-taking
   - become more aggressive with the competition
   - become more proactive
   - offer more autonomy to its employees

3. **Modes of renewal**
   To exploit the opportunities afforded by the Internet is your firm likely to:
   (Scale: 1—not likely at all; 7—extremely likely)

   - acquire an Internet firm
   - acquire a competitor actively using the Internet
   - create an internal (in-house) start-up
   - create an external start-up—external to the bounds of your existing company

4. **Organisational renewal (OR)**
   In response to change in the environment due to growth of the Internet, the extent of changes made by your firm in:
   (Scale: 1—negligible change; 7—tremendous change)

   - products offered
   - services offered
   - geographic markets served
   - customers served

5. **Process renewal**
   In response to change in the environment due to growth in the Internet, the extent of changes made by your firm in:
   (Scale: 1—negligible change; 7—tremendous change)

   - business processes
   - operating Systems
   - operating procedures

6. **Technology level**
   The primary industry in which your firm competes can be considered a high-technology industry.
   (Scale: 1—completely disagrees; 7—completely agree)

Declaration of Conflicting Interests

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7 Appendix C: Questionnaire

Background Information
Which of the following best describes the primary industry of your organisation?
Are you aware of any initiatives to promote entrepreneurial behaviour in your organisation?
Have you initiated or been involved in any projects related to corporate entrepreneurship or innovation?
What is the approximate total number of employees within your organisation?
What is your organisations approximate annual sales revenue?
Which of the following best describes your current job level?
In what country do you work?
What is the approximate age of your organisation?
How long have you been an employee at your current organisation
Age
Gender

To what extent do the following statements apply to your preffered approach to corporate entrepreneurship or innovation projects?
1: Not at all - 7:Completely
Causation (Chandler et al, 2011)
We should analyse long run opportunities and select what we think will provide the best returns
We should develop a strategy to best take advantage of resources and capabilities
We should design and plan business strategies
We should organise and implement control processes to make sure we meet objectives
We should research and select target markets and do meaningful competitive analysis
We should have a clear and consistent vision for where we want to end up
We should design and plan production and marketing efforts
Experimentation (Chandler et al, 2011)
We should experiment with different products and/or business models
The product/service that we now provide should be essentially the same as originally conceptualized
We should try a number of different approaches until we find a business model that works
The product/service that we now provide should be substantially different than we first imagined
Affordable loss (Chandler et al, 2011)
We should be careful not to commit more resources than we could afford to lose
We should be careful not to risk more money than we were willing to lose with our initial idea
We should be careful not to risk so much money that the company would be in real trouble financially if things didn't work out
Flexibility (Chandler et al, 2011)
We should allow the business to evolve as opportunities emerged
We should addapt what we were doing to the resources we have
We should be flexible and take advantage of opportunities as they arise
We should avoid courses of action that restricts our flexibility and adaptability
Pre-commitments (Chandler et al, 2011)
We should use a substantial number of agreements with customers, suppliers and other organizations and people to reduce the amount of uncertainty
We should obtain pre-commitments from customers and suppliers as often as possible

Entrepreneurial Orientation - Individual Level (Covin et al, 2020)
1: Strongly disagree - 7: Stongly agree
Innovativeness
I have very little problems with renewal and change.
I quickly master new routines, procedures and new ways of working.
When it comes to problem solving, I always search for creative solutions instead of familiar ones.
Proactiveness
I always try to find if (internal) clients have wishes or desires that they are not consciously aware of.
I always actively help internal clients, and not only when I am asked or approached to do so.
I am constantly looking for new ways to improve my performance at the job.
Risk-taking
I value new plans and ideas, even if I feel that they could fail in practice.
I sometimes provide assistance to internal clients without first discussing this with my supervisor.
In order to be more productive, I sometimes act without the permission of my supervisor.

Regulatory Focus at Work Scale (Wallace & Chen, 2006)
Promotion focus
1: Never - 7: Consistantly
I focus on…
Accomplishing a lot at work
Getting my work done no matter what
Getting a lot of work finished in a short amount of time
Work activities that allow me to get ahead at work
My work accomplishments
How many job tasks I can complete
Prevention focus
I focus on…
Following rules and regulations at work
Completing work tasks correctly
Doing my duty at work
My work responsibilities
Fulfilling my work obligations
On the details of my work

8 Appendix D: Plagiarism Declaration Form

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.

_____

Etienne Le Roux

01 December 2020

9 Appendix E: Copyright Declaration

Gordon Institute of Business Science
University of Pretoria

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

22.1 COPYRIGHT DECLARATION FORM

Student details			
Surname:		Initials:	
Student number:			
Email:			
Phone:			
Qualification details			
Degree:	MBA	Year completed:	
Title of research:	GIBS		
Supervisor:			
Supervisor email:			

Access

A.	My research is not confidential and may be made available in the GIBS Information Centre and on UPSpace.

I give permission to display my email address on the UPSpace website

Yes		No	

B.

	My research is confidential and may NOT be made available in the GIBS Information Centre nor on UPSpace.

Please indicate embargo period requested

Two years		Please attach a letter of motivation to substantiate your request. Without a letter embargo will not be granted.
Permanent		Permission from the Vice-Principal: Research and Postgraduate Studies at UP is required for permanent embargo. Please attach a copy permission letter. Without a letter permanent embargo will not be granted.

Copyright declaration

I hereby declare that I have not used unethical research practices nor gained material dishonesty in this electronic version of my research submitted. Where appropriate, written permission statement(s) were obtained from the owner(s) of third-party copyrighted matter included in my research, allowing distribution as specified below.

I hereby assign, transfer and make over to the University of Pretoria my rights of copyright in the submitted work to the extent that it has not already been affected in terms of the contract I entered into at registration. I understand that all rights with regard to the intellectual property of my research, vest in the University who has the right to reproduce, distribute and/or publish the work in any manner it may deem fit.

.

Signature:	Date:
Supervisor signature:	Date:

10 Appendix F: Certification of Data Analysis Support

I hereby certify that (please indicate which statement applies):

• ***I DID NOT RECEIVE*** *any additional/outside assistance (i.e. statistical, transcriptional, and/or editorial services) on my research report:*

…….

I hereby declare that all *statistical write-ups and thematic interpretations of the results for* **my study were completed by myself without outside assistance**
NAME OF STUDENT:
…….

SIGNATURE:
…….

STUDENT NUMBER:
……. ……

STUDENT EMAIL ADDRESS:
……

11 Appendix G: Ethical clearance letter

Gordon Institute of Business Science
University of Pretoria

12Ethical Clearance Approved

Dear Etienne Le Roux,

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