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Agential independence and interdependence in the workplace: preparing students for vocational internships

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Abstract

This pilot study interrogates the notion of human agency. The dimensions of agential independence and interdependence and their relationship to the performance of graduates in the workplace are explored. A model representing the latest conceptions around innovation in the SME and enterprise sectors in the business environment is developed. The model is then used in conjunction with the Independent-Interdependent Problem-Solving Scale (IIPSS) to explore an optimum placement strategy for students on the basis of their IIPSS index.

Keywords: *human agency; agential independence; agential interdependence; entrepreneurship; intrapreneurship; vocational internships*

1. Introduction

1.1 Background and Objective

The Cape Peninsula University of Technology (CPUT) offers a range of formal and non-formal professional and vocational courses. Internship placement is an important and integral aspect of the curriculum and is regarded as being crucial to the career development of students. Students are placed in various industries, including the enterprise sector and the small business environment. CPUT achieves high placement rates for our graduates and has maintained robust long-term relationships with industry partners to support our internship programmes. The continuous pursuit to achieve alignment of exit level outcomes with evolving industry requirements is key to sustaining the success of these relationships [1] [2] and ultimately ensures the successful placement of our graduates in industry.

This study is part of on-going research conducted in support of the CPUT Information Technology (IT) programme and our research focus is therefore on students of the formal and non-formal IT programme and limited to internship partners in the Information and Communications Technology (ICT) enterprise and SME sectors. Our findings are shared here with the intention of making our research available to the wider tertiary education community, to invite collaboration and to stimulate further research.

1.2 Aim of the Study

The Problem. Industry requirements in the fast-paced information economy are continuously evolving. This presents a challenging problem for universities of technology. They must keep pace with these changes if they are to achieve alignment of higher education outcomes in industry needs and thereby remain relevant. This is crucial in order to ensure that graduates are adequately equipped with the relevant knowledge, skills and capabilities to perform effectively in the workplace [1] [2].

The Questions. In pursuing the research problem in the context of our study, the following questions need to be addressed. What are the latest innovations in industry that should be considered for integration into the curriculum? What skills and proficiencies need to be considered to ensure that graduates continue to perform effectively in the workplace? What are the similarities and differences in the requirements of the enterprise and SME sectors that could inform our graduate placement strategy? How may graduates be effectively assessed and evaluated to determine optimum placement in different industry environments and to guide remediation?

The Method. Firstly, the contribution of the theory of Human Agency to recent skills research will be reviewed in the literature study. Human Agency (HA) will be positioned within a matrix of skills and proficiencies that are appropriate to the alignment of learning outcomes with industry needs. Following on from this, the aim of this pilot study is to conduct exploratory research into the dimensions of agential independence and interdependence and their relationship to the performance of graduates in different industry environments. Secondly, the latest conceptions around innovation in the business environment will be interrogated to determine the current state of industry requirements. The effective interaction between innovative capability and

dimensions of human agency will be explored. To this end, a concept model representing the relationship between entrepreneurship in the small medium enterprise (SME) and enterprise environment and the HA orientation of agential independence and agential interdependence will be developed.

This study furthermore seeks to establish an approach to measure the agential orientation of students with the view of optimizing their placement. The concept model is used in conjunction with the “Independent-Interdependent Problem-Solving Scale” or IIPSS of Rubin et al [3] to establish an optimum placement strategy for either the SME or enterprise environments. The efficacy of the IIPSS as a tool to guide the placement of students to the particular industry type on the basis of their IIPSS index is assessed.

Literature Study

A wide variety of studies, Information Systems Association reports, government and e-skills consortia reports have assessed ICT industry requirements both in South Africa and internationally and have developed typographies and rankings of skills and proficiencies that are appropriate to current industry needs. In doing so, they have identified ICT core technical knowledge and skills, business expertise, soft skills and personal attributes (such as interpersonal abilities, communication and team skills, creative and critical thinking skills) as of importance [1] [4]-[7].

A number of recent studies have emphasised the significance of personal attributes as critical success factors and have stressed the need for further research [1] [8]. The skills matrix and ranking from McMurtrey et al [2] Table 1 here following is a good representative example of this. It is notable that the matrix coheres significantly with the IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems. [5]

Table 1. Top Twelve Skills
McMurtrey et al [2]

Rank	Skill	Area	Mean	t-value *	Sig. more imp. than
1	Problem Solving	Personal Attributes	6.69	4.24	Oral Comm.
2	Critical Thinking	Personal Attributes	6.59	3.30	Oral Comm.
3	Team Skills	Personal Attributes	6.52	2.64	Oral Comm.
4	Oral Comm.	Personal Attributes	6.22	5.69	Ethics/Privacy
5	Creative Thinking	Personal Attributes	6.18	5.34	Ethics/Privacy
6	Written Comm.	Personal Attributes	6.07	4.51	Ethics/Privacy
7	Ethics/Privacy	Business Expertise	5.46	3.25	C-S Databases
8	Database (2 items)	IS Core Knowledge	5.24	1.97	Languages
9	C-S Databases	Proficiency	4.98	N/A	N/A
10	Languages (4 items)	IS Core Knowledge	4.96	N/A	N/A
11	Security	Business Expertise	4.93	N/A	N/A
12	Object-Oriented	IS Core Knowledge	4.80	N/A	N/A

*Significant at $p < .05$. For significance, the t-value must be greater than 1.96

While the preceding studies highlight the importance of personal attributes and identify the importance of personal and cognitive skills, they lack the inclusion of the critical success factors that drive performance. They address capability and competence but not the essential elements of motivation and efficacy. We have subsequently striven to find an analytic context in which to structure our exploration in this area.

As a driving concern of our research is to determine the factors that could optimize the efficacy and performance of graduates, we have turned to Social Cognitive Theory and the attendant Theory of Human Agency to explore the means by which technical, business, inter-personal and cognitive skills are sustained and brought effectively into action. As Bandura defines it, human agency encompasses those “self-organizing, proactive, self-reflective and self-regulative mechanisms” that drive self-efficacy [9] - in this sense, HA can be viewed as a ‘master skill’ being the key to the effective actualization of all others. Of these functions, the core driver of motivation and action is self-reflexivity. The individual is empowered through achieving success in the work or academic environment. By reflecting on this achievement, the individual generates a sustaining self-efficacy belief that becomes a source of motivation and enablement when facing new problems and challenges [9].

The primary aim of this study is to explore the dimensions of agential independence and interdependence and their relationship to the performance of graduates in the workplace. The concept of agential independence (AI) is essentially equivalent to the preceding definition of HA itself. Central to both of these notions is a person’s capability to act independently of the environment, to be self-organizing, proactive, self-reflective and self-regulative [9]. In addition AI requires reflexivity and thereby the capacity to abstract oneself from the immediate situation, no matter how challenging, and to be driven by the prior experience of competence [10]. This agential orientation also has an effect on human interaction in the workplace. The agentially independent individual will develop the capacity to rely on themselves to solve problems and achieve their goals. Conversely, AI will correspond with the need to consult others and to rely on them to achieve objectives. This correlation between

these qualities of AI and problem solving orientation suggest further that the *Independent-Interdependent Problem-Solving Scale (IIPSS)* of Rubin et al is a viable means of testing agential orientation [3].

It is important to consider the dimensions of HA when matching students to the type of workplace environment in which they are placed as they may have a significant impact on their performance. Accordingly, it has been necessary for our current research objective to review the latest conceptions around innovation in the business environment to optimize student selection for either enterprise or small medium enterprise (SME) positions. Innovation behaviour is closely associated with entrepreneurship and has received significant attention during the last decade. At the same time, the SME sector has been seen as a locus of economic growth and job creation during the protracted period of economic stagnation [11]. The corporate sector has consequently sought to harness the entrepreneurial spirit of autonomous individuals and their ability to discover new products, business opportunities and markets [12].

This confluence of entrepreneurship - the domain of the independent, innovative and effective individual and in essence, a self-organizing, proactive and self-regulative process - with the strategic objectives of corporate strategy provides the point of departure for the development of our conceptual model of agential orientation and business innovation. The characteristics of the entrepreneur correspond closely to those of human agency and an agential independent orientation as previously reviewed. This is most evident in the definition of De Jong & Wennekers [12] who identify the entrepreneurial individual as one who is proactive, having a strong desire for action, an initiator of activities without seeking the approval or permission of others and one whom persists in their entrepreneurial activity notwithstanding the negative reactions of others or their environment. The parallel between the defining characteristics of the entrepreneur and the AI orientation are strikingly evident. The SME or self-owned business is also perceived to be the domain of the entrepreneur, where the independent process may flourish unencumbered [12]. Conversely entrepreneurship in the enterprise sector occurs in an environment where there is a requirement to consult with and be directed by others. The enterprise is seen as the domain of intrapreneurship where initiative originates top down from corporate imperative and the innovative activity is circumscribed by enterprise strategic objectives [13]. The defining characteristics of intrapreneurship would accordingly map to agential interdependence. This would provide a neat solution and outcome for our study. Our student placement selection would accordingly be made on the basis of the agential orientation of students and independent students would be placed in internships in the SME sector and interdependent students sent to enterprise.

The first version of our concept model showing the interrelationship between human agency, entrepreneurial orientation and placement in the enterprise or SME environment is shown in Figure 1 following.

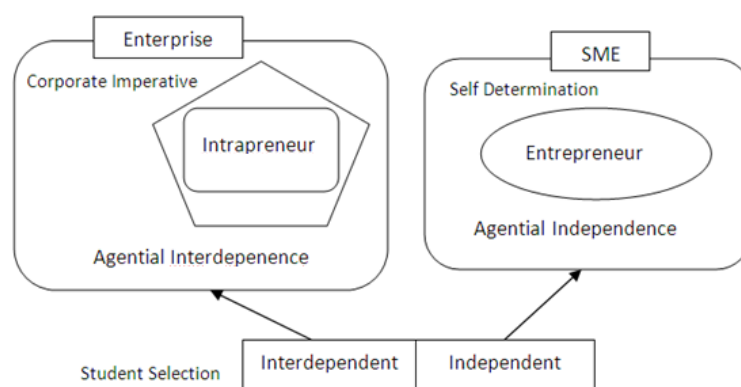


Figure 1. Concept Model I
As developed by the authors

As our focus group revealed and further literature study indicated, the situation is more complex. In the SME environment the individual entrepreneurial process has free rein. However, as a result of limited capacity, skills, knowledge and resources, the business on an operational level is ultimately sustained by establishing interdependent relationships with other SMEs and organizations [14]. Conversely, in the corporate environment, intrapreneurship is only effective if the independent entrepreneurial spirit is allowed to flourish unencumbered. The corporate entrepreneur in the enterprise business development department also enjoys the benefit (and added independence) of having ready access to enterprise intellectual capital and resources from other departments. In addition, not having to be a jack-of-all-trades, the intrapreneur is able to devote undivided attention to creative entrepreneurial activity[13]. What is important to note however is that agential independence is the point of departure, and that it is from this locus at the personal level that interdependent synergistic relationships that sustain the entrepreneur are made at the organizational level – inter-firm in the SME environment and for the intrapreneur, inter-departmental relationships in the enterprise environment [12].

Our concept model has evolved accordingly as illustrated in Figure 2. Concept Model II following.

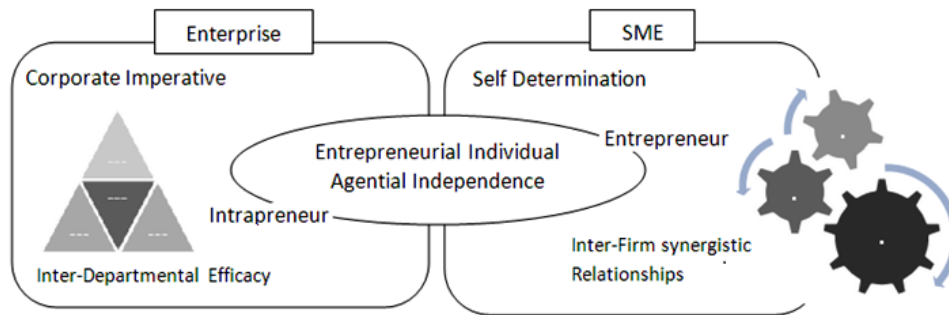


Figure 2. Concept Model II

Developed by the authors. Elements adapted from Åmo & Kolvreid [13]

It is important to clarify the relationship between agential independence and the ability to work in teams as this is an important attribute associated with efficacy in the workplace, particularly in the ICT industry [2] [5]. The self-reliance of the agentially independent individual does not imply that he or she will be lacking in team skills. On the contrary, the proactive and self-regulating qualities of agency make for a valuable team member.

The secondary aim of our ongoing research is to explore the viability of fostering agential orientation through training and mentoring. In the context of this study, this would involve the development of agential independence as a driver of innovative behaviour into a teaching and learning practice. A starting point has been provided by researchers such as Lassig [15] who have conducted rigorous studies of the social and environmental conditions under which creative behaviour may be fostered. In addition, she identified the means by which creative self-efficacy, a core tenet of HA, could be nurtured through reflexive educational practice. This is supported by a significant body of research by writers such as Do & Gross [16] as well as Nanda & Sorensen [17] who have looked at the effect of peers in the workplace on the development of innovative and entrepreneurial behaviour. It is beyond the scope of this pilot study to go further into this research. The significant effect of colleagues and mentors in the ICT industry through collaboration and job shadowing is addressed in the discussion of results of the structured interview.

In conclusion, whether they are to enter the SME or corporate domain, the literature study has indicated that students should be selected on the basis of agential independence for optimum graduate placement and efficacy in the workplace in both the corporate and SME environment where the innovative and independent behaviour is effective and highly valued. The research of Rubin et al [3] confirms that the Interdependent-Independent Problem Solving Scale (IIPSS) can be a reliable indicator of independence. Whether it may be successfully used as the basis for selecting CPUT students for optimum placement based on their agential independence orientation is assessed as follows.

2. Methodology

Data collection towards establishing a plausible theoretical model in support of the “agential orientation” conception has been done through literature search. Data collection towards gaining insight into the placement preferences of students was achieved by using the Independent-Interdependent Problem-Solving Scale (IIPSS) quantitative instrument. Exploration of the imperatives for redressing agential orientation through training has been achieved through semi-structured interviews of relevant industry professionals.

2.1 Quantitative Analysis

The Independent-Interdependent Problem-Solving Scale (IIPSS) questionnaire [3] was delivered to 94 students at CPUT in the formal National Diploma IT and non-formal ICT Academy vocational programmes in their first and second year of study. The aim was to establish if the IIPSS was able to reliably determine which of the 94 students fall significantly into either the independent or interdependent group and thus determine their agential orientation. This would indicate if they were ready for industry internship or if they required further preparation prior to their internship placement.

The students answered a set of ten questions, five indicating independence and the other five dependence such as: “In general, I do not like to ask other people to help me to solve problems” or “I do not like to depend on other people to help me to solve my problems” vs “I usually prefer to ask other people for help rather than to try to solve problems on my own”. The questions were scored on a 7 point Likert-like scale ranging from 1 “Strongly Disagree” to 7 “Strongly Agree”, the median response being 4 “Neutral” [3].

The participants' responses to the independent problem-solving items were reverse coded and then the average score of all 10 questions computed so that independent problem-solving achieved a low score and interdependent problem-solving a high score.

2.1.1 Reliability

Cronbach's alpha indicated a questionable result for the interdependent group and poor result for the independent group. Possible reasons for this are discussed in the results section following. As the ultimate outcome of the survey resulted in a productive qualitative analysis, this measure of internal consistency is not of significant concern and is given here following in Table 2. for completeness.

Table 2. Reliability Statistics

Points	Cronbach's Alpha	N of Items
Independent Group	.518	5
Interdependent group	.643	5

2.1.2 Results

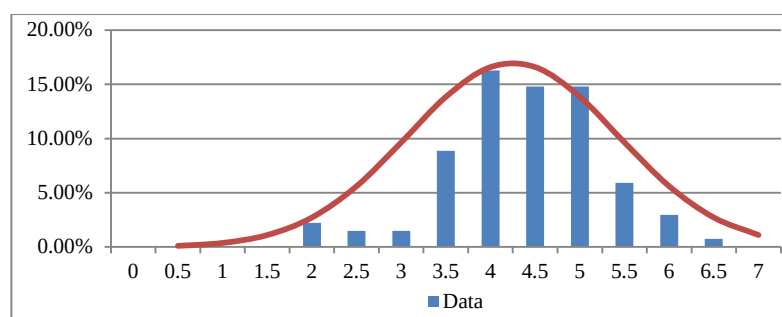
Following the procedure used by Rubin et al in the pilot test of the IIPSS [3], respondents would be grouped as independent problem solvers if their scores were lower than the mean of the scores minus 1 standard deviation and as interdependent problem solvers with scores higher than the mean of the scores plus 1 standard deviation. Assuming a normal distribution this would by default exclude 68% of the participants and of the remainder, 16% would be independent problem-solvers and 16% would be interdependent problem-solvers.

We conducted an exploratory analysis of the data on this basis. The results were more extreme than anticipated. Only 10 students (10.6 % of the students) could be classified as Independent Problem Solvers and 13 students (13.8% of the students) could be classified as Interdependent Problem Solvers and 75.5% of our students were unable to be classified in either of the groups. The results are illustrated in Table 3 following.

Table 3. Categorical Analysis of Results

Points	Frequency	Percent	Valid Percent
Neutral Range Score	71	75.5	75.5
Independent Group	10	10.6	10.6
Interdependent group	13	13.8	13.8
Total	94	100.0	100.0

The analysis revealed significant kurtosis in the distribution, the majority of the values being in the peak and less than would normally be expected in the tails. These results were instructive as this indicated that a higher than expected proportion of the students tended towards the median score (responding in the range of partially agree-neutral-partially disagree range of the scale with cut off at 3.2 and 5 respectively) and were significantly neither independent nor interdependent problem solvers. This is given here as a graphical illustration in Figure 3 following.



Low scores Independent, Median 4 Neutral, high scores Interdependent
Figure3. Descriptive Analysis of Results and Normal Curve

2.1.3. Discussion of Results

From the standpoint of a categorical analysis, the IIPSS does not advance our strategic objective of selecting students on the basis of AI for optimum student internship placement in either SME or Enterprise workplace environments. Were we to proceed on this basis, our placement rate would be 10.3% and 89.7% of the students

would remain on campus in the Simulated Industry Exposure programme for remedial intervention when our present profile is the inverse of this.

The results were submitted to Mark Rubin, a co-author of the IIPSS for comment [3]. He identified the kurtosis in the distribution of the results mentioned previously, and recommended that the IIPSS score be used as a continuous variable rather than as categorical indication of group membership and that the data should be analysed instead as a correlation between the IIPSS score and preparedness for internship placement. The adoption of this approach enables the assessment instrument to reveal significant, useful insights that advance our original exploratory research objective.

The literature study brought us to the conclusion that agential independence is the key characteristic to be identified and developed for optimum industry placement. In addition AI is also leveraged to achieve success in important interdependent relationships at the inter-firm level in the SME and inter-departmental efficacy in the corporate sphere. Accordingly, independent and interdependent agential orientations may be viewed as complimentary rather than mutually exclusive. If the results of our IIPSS survey were viewed in this light, it would indicate that both our independent and interdependent tending individuals have achieved part of the objective and require the development of the counter capability. The independent group however have an advantage, as agential independence can be leveraged to pursue interdependent relationships at another level. As revealed by the focus group, mentoring relationships can also result in growing confidence and independence.

The large middle field provides a fertile ground for further research questions. It may be the case that majority have already arrived at our current understanding and are not in two minds about certain of the questions. Perhaps when considering the question “I prefer to make decisions on my own, rather than with other people” and “I value other people’s help and advice when making important decisions” they do not find the two mutually exclusive. The agentially independent, self-reflexive individual having attempted to solve a problem themselves but not having succeeded, now actively seeks and evaluates advice in order to reach an informed decision. Whether the students in the 75.5% middle range lack or possess both agential characteristics and require engagement to distinguish and develop them, are compelling questions to be addressed in future research.

2.2 Focus Group Interview

A focus group interview was held with four ICT professionals with between 15 to 30 years of experience, representing a cross section of the industry. The group was comprised of: a consultant and ex CEO of a national tertiary education and research network; a corporate client account manager who worked in two of South Africa’s leading internet service providers; a business owner of an SME Network Infrastructure Solutions Provider and consulting firm which outsources expert engineers to enterprise clients; and a certified internet expert engineer with extensive experience of working in corporate networks and ISPs. The session was recorded and transcribed in note form.

The nature of the research project was described to them as an initiative to identify industry requirements to assess students prior to placement in industry internship programmes and adequately prepare them for optimum performance in the workplace.

Three questions were put to them.

- a. What are the qualities that you look for that would ensure the successful placement of an IT graduate in your internship programme and ultimately employment?
- b. Which of the qualities of independence or interdependence do you value more in a prospective employee or are both equally important in areas like problem solving and achieving goals?
- c. Considering your answers to 1 and 2, do you think these qualities can be developed through training / mentoring / experience?

2.2.1 Results

CEO

The CEO advised that the assessment should take place as an entrance test at the commencement of university education so that remediation was part of the university education. He felt that this could be achieved by assigning the student to a mentor to build the confidence of the student.

Corporate Client Account Manager

The account manager valued maturity, emotional intelligence, interpersonal skills and the ability to communicate in a professional manner and remain calm under stressful conditions. He particularly looked for

an individual who could understand their role as part of a delivery chain and who possessed team and client skills.

SME Director / Consultant

The Director held that the engineering skills of an incumbent engineer are far less important than personal attributes which were the most important characteristic he looked for in a prospective engineer – he said it was relatively easy to pass an entry level network engineer certification but that what really counted in his opinion was the personality of the individual. He cited ability to prepare and plan for a client project, understanding of the implications of being responsible for a client's network (and the trust relationship that this involved) and personal accountability as critical factors.

He also considered independence was to be paramount as well as the ability to solve problems and conduct research on own initiative. This was a key characteristic that he looked for when hiring an engineer. He added that the ability to develop and sustain effective support relationships provides an enormous stimulus for growth. He felt that interdependence creates value when the successful combination of the different skills and abilities of the individual members are necessary for the success of the venture. He added the proviso that as an integral part of the whole, if the individual is not capable in their own right the venture fails.

Expert Engineer

The expert engineer viewed the career progression from novice to expert as a development path from interdependence to independence. In his work he performs the role of mentor when allowing junior engineers to job shadow him. Yet he felt that as an expert engineer, one still found benefit in synergistic relationships.

2.2.2 Discussion

The contribution of the CEO to the interview revealed that an interdependent mentoring relationship can build independence during the formative process. This was confirmed by the expert engineer who conducted these relationships. The CEO confirmed that independence should be an exit level outcome and should be achieved by the educational system prior to placement.

The Director was of the opinion that personal attributes are of the highest significance. Of these, human agency which he described as being proactive, having self-regulation and being prepared for the job was paramount. In addition, an understanding of accountability and possessing awareness of their role in a client trust relationship was critical. This was in accordance with the hypothesis that independence is a key characteristic, is prior to interdependence, and is related to problem solving ability. Originating from a starting point of independence, the value creation possibilities of interdependent synergistic relationships was confirmed and the contribution of this interviewee accorded with the second iteration of our concept model.

3. Conclusion

The literature study revealed that the theory of Human Agency has a valuable contribution to make to current skills education and industry alignment research. Recent studies that rank key capabilities in a sequence from technical knowledge to personal and cognitive attributes omit the drivers of performance in the workplace. Human agency is the engine of self-efficacy and can be seen as a 'master skill' that achieves the actualisation of all the others.

The development of the model that mapped the dimensions of agential independence and interdependence and their relationship to the conceptions of entrepreneurship and intrapreneurship in enterprise and SME environments successfully guided and evolved our strategy for optimum graduate placement. Our initial tendency was to identify agential interdependence as a defining success factor in the enterprise domain where corporate strategy is the source of direction as opposed to independence as the success factor in the SME environment where self-determination is the driving process. Ultimately, further exploration revealed that without agential independence existing freely in both environments, the essence of innovation is extinguished. Furthermore, without the sustenance of interdependent relationships at the organisational level, the longevity of the process could not be assured either. As it was determined that independence was the core attribute, students could be placed on the basis of their IIPSS index for independent orientation in both environments.

The focus group session provided significant corroboration of this complementary nature of agential orientation and the viability of expanding the interview process in future research.

The study was a pilot study and while the quantitative research process did not achieve our goal of selecting students for optimum industry placement, the interrogation of the results yielded significant and viable insights and achieved our research objective to advance our theory and guide further research. As an insignificant number of respondents fell into the independent or interdependent categories, it made more sense to analyse the

data as a correlation and trend analysis. From this perspective the data confirms the insights of our literature study. As the development of our conceptual model revealed, both agential interdependent and independent capabilities were necessary for performance in the SME and enterprise environments but in combination, not in isolation. Accordingly, those with high or low IIPSS scores would benefit from the development of the complementary capability to prepare them for internship. Whether the majority in the middle range lack or possess both agential characteristics are compelling questions to be addressed in future research.

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