Research papers

Screening for self-directedness: A method for recruiting savvy analysts in a dynamic business environment

Jennifer L. Dapko
Assistant Professor of Marketing, Florida Southern College, USA

Jennifer Dapko is an assistant professor of marketing in the Barney Barnett School of Business and Free Enterprise at Florida Southern College, where she teaches marketing and analytics courses. Outside the classroom, Dr Dapko has been immersed in the world of marketing since 1998, helping companies build integrated marketing strategies with a more recent focus on digital marketing.

Florida Southern College, 111 Lake Hollingsworth Drive, Lakeland, FL 33801, USA
Tel: +1 863 680 4352; E-mail: jdapko@flsouthern.edu

Gregory J. Snyder
Adjunct Professor, Florida Southern College, USA

Greg Snyder is an adjunct professor at the Barney Barnett School of Business and Free Enterprise at Florida Southern College and a director of business analysis for Publix Super Markets, Inc. He has spent his 30-year career working in the fields of business analysis and analytics, primarily specialising in the aspects of supply chain and retail.

Florida Southern College, 111 Lake Hollingsworth Drive, Lakeland, FL 33801, USA
Tel: +1 863 680 4280; E-mail: gsnyder@flsouthern.edu

Abstract   Analytics is changing at the speed of thought. If analysts are not capable of and motivated by self-directed learning, they will be left behind and their organisations will be left scrambling to keep up with their competitors. Even the best company-directed learning programmes cannot always keep pace with this change, and most analysts will find company-directed technical training falling short of their needs. Self-directed learning enables analysts to stay relevant and motivated in a quickly changing business world, and self-directedness is a key employee characteristic in creating adaptable and flexible organisations. This paper discusses ways in which hiring managers can screen analysts for self-directedness during the interview process. As important as it is for hiring managers to recruit a workforce with self-directedness, it is equally important to set up an environment where a self-directed learner can thrive and utilise those skills. Therefore, this paper will also discuss ways in which organisations can nurture self-directed learners once recruited.

KEYWORDS: self-directed learning, self-directedness, business analytics, analytics training, hiring analytics employees, employee motivation, employee learning

INTRODUCTION

The need to recruit analysts is greater than ever as business leaders shift data and analytics to a core business function rather than a secondary focus.[1] It is important that hiring managers recruit self-directed analysts who can keep up with the pace of change, such as with new programmes, techniques and business requirements.[2]

It is challenging for organisations to develop a business culture of learning and to create employees who are self-motivated learners.[3] One way to overcome this challenge is to screen for and recruit employees who are already committed to self-directed learning (SDL).

SDL is a process by which employees take responsibility for, and control of, their own learning needs. Sparked by motivational interests and workplace circumstances, employees do this through deliberate SDL projects or tasks that generate specific and long-lasting knowledge, skills or abilities.[4] This is over and above the learning opportunities provided by their supervisors and by the organisation itself.[5]

In addition to keeping pace with job and business requirements, there are other reasons to screen for and recruit analysts who are committed to SDL. Analysts who are high in self-directedness may be more creative, curious and satisfied in their job roles compared with those who are not self-directed learners.[5] Hiring self-directed learners benefits the business through improved employee performance and improved business performance.[4]

Given the pace of change in analytics and data science, and the relative recency of its growth, businesses with a desire to build and maintain a useful analytics programme have a few choices:

- outsource their analytics capabilities to a third-party firm specialising in analytics;
- hire analysts adept in current technologies and methods and attempt to build

structured training programmes to keep their skills current; or
- hire analysts who demonstrate an aptitude for SDL and encourage them to seek independent learning opportunities.

The first choice is certainly acceptable, particularly for smaller businesses or those first delving into analytics. However, the third party may not have the in-depth, specific knowledge of the business needed to solve highly nuanced business problems, while the business leaders may not have the skills needed to delineate the business problems clearly.

The second choice is a shorter-term fix, which will inject analytics capability for a period of time, but which will erode over time as technology and analytics methods evolve and the pace of corporate training initiatives become either too slow or too costly.

This paper explores the third choice — hiring candidates who are not only adept in current technologies but also skilled in applying SDL to keep up with the pace of change.

SCREENING ANALYSTS FOR SELF-DIRECTEDNESS

Hiring managers can screen analytics professionals for self-directedness by: (1) probing for specific types of SDL experiences and (2) assessing the candidate's self-directedness temperament and character trait. Each is discussed below.

Screening analysts for types of self-directed learning

One way to screen analysts for SDL is to ask candidates for examples. There are four types of SDL: induced, synergistic, voluntary and scanning.[6] Below is a discussion of each type along with examples to help the hiring manager identify SDL in candidate responses.

Induced SDL projects

Induced SDL projects are unstructured, on-the-job learning opportunities and

are triggered by a discrepancy between an analyst's current and expected level of knowledge, skills and abilities (KSAs). Induced SDL projects occur when an analyst recognises an immediate need for learning in order to be successful in their role.

For example, business knowledge is a highly sought-after trait when hiring analysts.[7] However, a recently hired analyst will lack specific business knowledge and should, therefore, be highly motivated to learn the business and the nuances of its data in order to be successful in the job role. Most of an analyst's day-to-day learning occurs by asking peers, conferring with managers, searching the internet, or by simple trial and error. Most of these are induced learning tasks, where the analyst has an immediate, critical need for model or data assistance as they resolve a novel business problem. Analysts may also engage in induced SDL projects to learn new analytics methods and technologies that the company mandates.

Interview prompts and questions for hiring managers that can help tease out experience with induced SDL projects include:

- 'If we hired you, what would be your process for learning about the business and the data you will be analysing?'
    — 'Does the candidate provide examples demonstrating the expectation to conduct his/her own self-directed research rather than an expectation to learn through guided learning opportunities?
    — To what extent does the candidate recognise that there is much to learn about a new company and its data?
    — To what extent does the candidate acknowledge that learning the business and its data are important to the success of an analyst?

Synergistic SDL projects

Synergistic SDL projects are triggered by a motivation to enhance one's KSAs within the context of one's job role, but without the immediate time pressure or KSA imbalance as with induced SDL projects. Analysts seeking to improve their job-specific skills for greater job performance engage in synergistic SDL projects.

Keeping up with the latest analysis techniques and programmes or supplementing company-provided learning materials with their own self-guided learning are examples of synergistic SDL projects. The key ingredient to synergistic SDL projects is a personal willingness to pursue the learning.

Interview prompts and questions for hiring managers that can help tease out experience with synergistic SDL projects include:

- 'What new analysis technique or programme have you learned recently and what was your motivation for learning it?'
    — Was the candidate able to provide examples of learning recent analysis techniques and/or programmes?
    — Does the candidate mention the motivation was to do better in his/her job role rather than because it was required by his/her employer?

Voluntary SDL projects

Voluntary SDL projects are bound by neither urgency nor job-role requirements. Instead, a heightened personal motivation triggers the learning project. Voluntary SDL may occur when an analyst has an inflection point in their career. Voluntary SDL may also occur when they realise that there is a gap in their knowledge; and they would like to fill this gap either for future benefit or for self-actualisation.

For example, an analyst with a personal interest in new technologies who is aspiring to move into a data scientist role may spend their spare time learning or improving their KSAs in statistics, programming languages, data infrastructure and governance. Analysts

who take it upon themselves to learn new programmes or to develop new processes, for the benefit of the firm or for the benefit of job growth, are engaging in voluntary SDL projects.

Interview prompts and questions for hiring managers that can help tease out experience with voluntary SDL projects include:

- 'Tell me about a programme or statistical technique you learned to keep your skills fresh or to prepare for job advancement.'
  — Does the candidate provide an example of learning something new, for learning's sake or for job advancement rather than because it was required in his/her job functional role?

Scanning SDL tasks

Scanning, the fourth type of SDL is different from the others. Unlike induced, synergistic and voluntary SDL projects, scanning SDL is ongoing, rather than learning outcome oriented. It is driven by the motivation to stay current in one's field through a continuous search for relevant information. As such, scanning is not project-based but rather task-oriented and process-oriented.

For example, analysts using the popular programming language R may find themselves scanning for new packages in a continuous pattern, investigating what is new or improved. There are more than 10,000 CRAN packages for R, with more than 3,000 new packages in the first quarter of 2021 alone.[8]

Scanning SDL also happens naturally as inquisitive analysts converse and relate with each other and share 'war stories' about the problems they have solved and how they have attacked them. This example of scanning SDL may occur less frequently, although it is perhaps strategically very important. Much of the value with this example of scanning SDL is the cross-pollination of ideas from different teams. For example, as a member of

the marketing analytics team has lunch with a member of the supply chain analytics team, they may share solution ideas, leading to the analyst reading a white paper, studying the new idea and eventually using it in their own business context.

Interview prompts and questions for hiring managers that can help tease out experience with scanning SDL projects include:

- 'How do you learn about latest analytics and data science trends?'
  — Does the candidate mention subscriptions to relevant blogs, journals or podcasts?
  — Does the candidate belong to any relevant professional organisations?
- 'In your past experience, how has working with others, within your department and outside of your department, helped you as an analyst?
  — To what extent does the candidate acknowledge that learning can come from the cross-pollination of ideas?

Table A1 in the appendix provides an interview question checklist that hiring managers can print and use during candidate interviews.

Screening analysts for the self-directedness trait

A second way hiring managers can screen analysts for SDL is to probe for the self-directedness trait. Unlike directly asking candidates for SDL examples, this method uncovers whether or not candidates have the underlying traits exhibited by self-directed learners.

Researchers relate the trait of self-directedness to temperament and character and define it as 'self-determination and willpower or the ability of an individual to control, regulate and adapt behaviour to fit the situation in accord with individually chosen goals and values'.[9] In self-directedness, there are five lower-

order subtraits.[9] The top four of these stand out as being useful to both analytics practitioners and analytics hiring managers:

- responsibility vs blaming;
- purposefulness vs lack of goal direction;
- resourcefulness vs inertia; and
- congruent second nature vs bad habits.

These four lower-order subtraits are consistent with the findings of the meta-analysis conducted by Boyer *et al.*, which found correlations between SDL readiness and: (1) goal-oriented motivation; (2) a person's belief that they have control over events in their life; and (3) a person's belief they have the ability to be successful in different situations.[4]

Responsibility vs blaming

The first SDL subtrait, responsibility, relies on the learner accepting that they are in control of their own actions and their responses to both positive and negative outcomes and not placing blame on external factors for their successes or failures. Those who accept that responsibility are more likely to rely on themselves to understand their own learning needs and to take the self-directed path toward fulfilling those needs.

Responsibility, then, is an important quality to screen for when hiring analytics professionals and can be measured either through formal approaches, such as the Hogan Personality Inventory (HPI), or through carefully crafted interview questions that tease out examples of responsible actions. The HPI is an example of a formal assessment tool that uses a series of timed questions based on socioanalytic theory to measure a person's normal personality, including 'prudence', which is described as a measure of responsibility, self-control and conscientiousness. A balance of the two methods, interview questions and more formal assessment tools, provides a solid foundation for measuring this facet of self-directedness.

Ideas for interview prompts and questions for hiring managers that can help tease out responsibility include:

- 'Tell us about your proudest professional accomplishment.'
  — To what extent does the candidate relate a sense of ownership and responsibility?
  — Was the candidate driven by internal, rather than external, factors?
- 'Talk about the last important thing that you learned.'
  — Does the candidate relate a story that shows self-direction of the learning event?
  — Was there a component that led the candidate to explore further than directed?
  — Was the candidate excited and enthusiastic about the learning?
- 'Describe a time you saw a problem at work and took the initiative to correct it yourself.'
  — Does the candidate show initiative, responsibility, or resolve?
  — Does the candidate relate a sense of responsibility?

Purposefulness vs lack of goal direction

The second subtrait of self-directedness is purposefulness, which characterises whether the employee is goal-oriented and whether they demonstrate the ability to delay gratification to achieve their objectives. The ability to delay immediate benefits in favour of a longer-term payout is not only a key trait of self-directed learners but also of leaders in general.[9]

To assess purposefulness and goal orientation, hiring managers should carefully assess the responses to candidate questions such as:

- 'Tell me about a time you set a goal for yourself. How did you go about ensuring that you would achieve it?'
  — Was the candidate self-directed in how he/she set the goal?

— Did the candidate eventually achieve the goal if he/she experienced obstacles?
- 'Talk about a time when you needed information from someone who was not responsive. What did you do?'
  — Was the candidate fixated on the objective, rather than on the conflict?
  — Did the candidate resolve the issue in a self-directed manner or did he/she need assistance?

Resourcefulness vs inertia

Resourcefulness, the third SDL subtrait, measures whether the job candidate is self-reliant in terms of being curious and open-minded, yet still focused on the business goal. In personality profile assessment tools, this can be measured in terms of inquisitiveness. When interviewing analytics candidates, it is important to discuss areas in which the candidate has been creative at problem solving, either in the classroom or in the workplace.

Hiring managers should look for areas in which the candidate has encountered a problem and found creative and self-directed ways to surmount the problem by asking questions such as:

- 'Give an example of a time when you needed to be creative at work (or in class). What was exciting or difficult about it?'
  — Does the candidate demonstrate excitement about the challenge?
  — Does the candidate relate that they learned something from the challenge?

Congruent second nature vs bad habits

The fourth subtrait of self-directedness is congruent second nature, described by Cloninger as a person's sense of hopeful purpose, self-acceptance, self-actualisation and resourcefulness.[8] This subtrait is more difficult to identify through interview questions, as these are difficult traits to assess through short interactions. Clues to congruent second nature can be found when reviewing a candidate's entire history of work, school and accomplishments. Has the candidate demonstrated the ability and desire to take on consistently more responsibility? Has the candidate's history of study, academic project work and career choices shown motivation and purpose rather than drifting from topic to topic? Does the candidate appear self-motivated and resourceful in terms of finding a path toward additional learning that shows congruency with their stated goals?

Specific questions that may be of help in assessing this hopeful sense of purpose revolve around how a candidate deals with conflict, such as:

- 'Give an example of a time you faced conflict while working on a team. How did you handle it?'
  — Does the candidate focus on the solution to the conflict rather than the conflict itself?
  — Does the candidate take accountability for diffusing the conflict and learning from it rather than placing blame on the other party or circumstance?
- 'Talk about a time when you wish you had handled a situation differently with a colleague.'
  — Does the candidate take accountability for the bad situation rather than placing blame on the other party?
  — Does the candidate relate that they learned something during the conflict resolution process?

Table A2 in the appendix provides an interview question checklist that hiring managers can print and use during candidate interviews.

While all four of these SDL subtraits can also be measured with practitioner tools such as the HPI,[10] it is important to note that these tools are useful to business managers and leaders only to the extent that they predict behaviour in the workplace.

While tools such as personality profiles and interview questions can help predict certain behaviours, they cannot guarantee successful outcomes; rather, they can only improve the odds of success.

NURTURING SELF-DIRECTEDNESS IN THE WORKPLACE

As important as it is for hiring managers to recruit a workforce with self-directedness, it is equally important to set up an environment where a self-directed learner can thrive and utilise those skills. Next is a discussion on how organisations can nurture the self-directed learner once recruited.

Instil a culture of learning from failure

A self-directed learner will likely grow frustrated and ultimately leave an employer if they are not enabled and encouraged to utilise their self-directed nature to help the business succeed. It is important to note that an environment that is nurturing to self-directed learners is one where certain types of failure are seen as a necessary outcome of analytical work.

This is not to say that an analyst who completes a flawed analysis or who implements a model with serious quality issues should be rewarded for causing business harm. It does, however, mean that an analyst who searches for an improvement to an algorithm but who falls short should be encouraged to learn new methods and continue the attempt. The simple fact is that most experiments to improve analytic models fail. Both Google and Netflix have reported that 90 per cent of their experiments do not yield an actionable result.[10] This is simply because it is very difficult to improve an already good model; the more refined an analytic model becomes, the more difficult it is to improve, and, therefore, the higher percentage of failed improvement attempts. Thus, it is important to set up an environment where

analytics managers actively encourage and acknowledge not only those small improvements to models, which yield results, but also those which fail to yield results.

In industrial operations safety, when an accident occurs, it is a best practice to identify and correct the behaviour that led to the accident rather than focus on the accident itself. For example, if a forklift operator drove recklessly and it led to an accident, counselling and retraining is required to address the forklift operator's behaviour and thus prevent further accidents. Similarly, when an analyst works independently to find a model or analysis improvement, it is their behaviour that should be rewarded rather than their success.

The self-directed analyst is bound to be much happier, well-adjusted and successful in an environment where management happily announces, 'I'd like to offer my thanks to Nancy, who developed a new ARIMAX alternative to our existing forecasting algorithm. While the new model didn't prove a successful improvement this time, the team learned a great deal and will be using this study as a foundation for model improvements in the future'. In other words, the result may not have been a triumph, but the process of continuous improvement through SDL was a resounding success. As Thomas Edison reputedly said, 'I have not failed. I've just found 10,000 ways that won't work'.

Some new analysts are comfortable with trial and error, their successes interspersed with failures. However, some are not used to failing and need continuous feedback to help them stay positive and to continue relying on their self-directed nature. After all, many of them had a successful record of accomplishment in high school, college and often post-graduate work. The concept of failing at something may be foreign and concerning to them. Thus, they must be retrained so that they understand that there are testing and quality guidelines within the

company to prevent meaningful failures, but that examination and process improvement attempts that do not pan out are positive experiences for the individual and the team.

Set boundaries and parameters for problem solving

As a business sets itself up to hire and embrace self-directed analysts who are destined not only for great successes but also great failures, it should also prepare to address the issue of perceived micro-management in the workplace. Indeed, this is one of the most common concerns among potential candidates for analytics jobs.

For new analytics employees, however, the major issue is one of under-management rather than micro-management. This is a danger not just in firms with large analytics departments, where new employees become part of a very focused and rigid structure without room to manoeuvre and learn, but also in small firms, where an analyst may be hired to fix problems without any real, clear idea of how analytics should be applied. Top business leaders may not be fully aware of the limitations of analytics and may be driven by a board's directive or a misconception created by advertising of analytics software. As a result, they may hire a data scientist with the direction to 'do the data science thing' with the company data. This is a recipe for disaster because, without a clear business problem to solve and a clear understanding of an organisation's analytics capabilities, a new data analyst or an aspiring data scientist will face an uphill battle and almost certain disappointment.

An aspiring data analyst or data scientist should not simply expect, but rather demand coaching from more experienced data scientists. Those with experience have a tremendous amount of knowledge to pass on, and new hires should take full advantage of any coaching opportunities that they encounter. This coaching, if delivered properly and in an environment of mutual

respect, will yield exceptional results from a high-functioning team.

The challenge for employers is to clearly lay out the parameters and requirements of the problem as well as the boundaries (eg what is allowed and what is not allowed) and then encourage the employee to solve the problem using analytics techniques. Some of the techniques may be relatively simple, such as a new or augmented forecasting algorithm for sales patterns. Employers need to set up an environment that enables small improvements to be implemented at scale and then relentlessly measured and improved. These improvements, both the successes and the failures, will ratchet the analytics team's results upward, propelled by a positive, failure-safe environment and a team of self-directed and well-trained analysts.

FINAL THOUGHTS
Final thoughts for hiring managers

In a recent survey of employers, independent learning ranked fourth most important out of 34 abilities, behind technical knowledge of Excel, Base SAS and SQL.[12] Hiring managers should recruit analysts that are independent learners, even when recruiting for entry-level business analytics businesses.[12]

As the speed of both technology and problem-solving increase, companies need self-directed analysts if they want to be successful. Even the best company-directed learning programmes are bound to be obsolete by the time they are implemented. Most analysts will likely find company-directed technical training falling short of what they need to be successful in their job role and should have the self-directedness to seek knowledge and training on their own accord.

Successful analysts provide meaningful insights to company impediments, and this requires a holistic approach to learning the technology, the data and the company's industry. Hiring managers should recruit

analysts who also exhibit self-directedness in learning about:

- the company, its customers and the industry it is in, to include strengths, weaknesses, opportunities and threats in relation to direct and indirect competitors;
- the company's internal political system and key players, and how this could hinder or help the analyst's success in delivering recommendations that are accepted and adopted;
- the data the company collects, how it collects it, and its nuances, which in organisations just starting out developing analytics teams may require self-directed projects to create data maps and data dictionaries; and
- applications, languages and infrastructure important to the job role. This includes staying current with tools that could enhance job performance and outcomes. Analysts just entering the workforce and experienced analysts switching to a new company may find the business using different tools and methods, requiring them to catch up and adapt quickly.

Hiring managers can gauge for this type of self-directedness in two ways. First, hiring managers should make note of the questions candidates ask about the company, the data it collects and the applications that candidates would use on the job. The candidate should be inquisitive; this will indicate that he/she understands the role that knowledge plays in analysis. Secondly, hiring managers should make note of the candidate's knowledge about the company and any SDL the candidate has completed to prepare for the interview. When candidates do not conduct SDL to prepare for the interview, this may indicate low self-directedness.

Final thoughts for business leaders

There is a story in the lore of Publix Super Markets, Inc., a large grocery chain in the south-east of the USA, known for its exceptional customer service. In the story, the founder of the company is entertaining a group of young store managers with his wisdom when he asks the managers to take out their pads and pens. 'I'm going to give you a number and I want you to write this down', he says. 'This is my phone number'. He then rattles off the digits. 'Now if you ever come across a problem with a customer that you can't solve, you call this number and I'll take care of it for you'. The managers thought about this for a moment and then proceeded to tear up the number. They knew they would never need it because they were, at that moment, empowered to solve independently any problem they came across.

That simple gesture housed a concrete lesson: self-directed, independent people who take responsibility for problems are more likely to solve them successfully and are hence more valuable to an organisation. Indeed, a self-directed, responsible learner may make the organisation itself more valuable. Hiring managers should take time to identify, isolate and carefully screen for the previously described traits of self-directed learners to maximise the long-term value of their analytical workforce and their company.

As stated earlier, the tools, techniques and practices of analytics are rapidly changing, and a successful analyst must be able to adapt quickly and independently in order to maintain their effectiveness as new data and new problems appear. Carefully screening for the SDL subtraits of responsibility, purposefulness, resourcefulness and congruent second nature are a good way to improve the odds of hiring an analyst with the learning style needed to succeed in a highly dynamic workplace.

At the same time, it is important to recognise that there are also downside risks to hiring an analyst high in these traits. For example, individuals who score very high on learning approach questions in a personality

assessment may focus more on learning new methods, rather than doing required, but mundane, tasks.[10] They may look for the newest models and technology while eschewing the existing methods, which may be useful, understood and preferred by the business. For example, a multilinear regression may be a tried and true, well-understood concept within the business, but the analyst with very high learning approach scores may be more interested in applying the latest forecasting algorithms with less regard to whether they will actually yield a measurable benefit to the business. Small, measurable improvements to existing models are often more useful than a complete revamp or a move to a completely new and poorly understood model.

Hiring managers and business leaders must take care to ensure that analysts have not only the capability to learn in a self-directed way but also the capacity to understand and appreciate the needs and practicality of the business environment.

References

1. Panetta, K. (2021) 'Gartner top 10 data and analytics trends for 2021', available at: https://www.gartner.com/smarterwithgartner/gartner-top-10-data-and-analytics-trends-for-2021/ (accessed 3rd April, 2021).
2. Ash, K. and Rahn, M. (2020) 'Reimagining workforce policy in the age of disruption: A state guide for preparing the future workforce now', available at: https://files.eric.ed.gov/fulltext/ED609014.pdf (accessed 3rd April, 2021).
3. Deloitte Development LLC (2020) 'COVID-19. The upskilling imperative. Building a future-ready workforce for the AI age', available at: https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/deloitte-analytics/ca-covid19-upskilling-EN-AODA.pdf (accessed 3rd April, 2021).
4. Boyer, S.L., Edmondson, D.R., Artis, A.B. and Fleming, D. (2014) 'Self-directed learning: A tool for lifelong learning', *Journal of Marketing Education*, Vol. 36, No. 1, pp. 20–32.
5. Edmondson, D.R., Boyer, S.L. and Artis, A.B. (2012) 'Self-directed learning: A meta-analytic review of adult learning constructs', *International Journal of Education Research*, Vol. 7, No. 1, pp. 40–48.
6. Clardy, A. (2000) 'Learning on their own: Vocationally oriented self-directed learning projects', *Human Resource Development Quarterly*, Vol. 11, No. 2, pp. 105–125.
7. Seliger, C. S. (2018). 'Exploring the knowledge, skills, and abilities of data science professionals', doctoral dissertation, Purdue University.
8. CRAN Project (n.d.) 'Available CRAN packages by date of publication', available at: https://cran.r-project.org/web/packages/available_packages_by_date.html (accessed 4th April, 2021).
9. Cloninger, C., Dragan, R., Svrakic, M. and Przybeck, T.R. (1993) 'A psychobiological model of temperament and character', *Archives of General Psychiatry*, Vol. 50, No. 12, pp. 975–990.
10. Hogan, R. and Hogan, J. (2007) 'Hogan Personality Inventory Manual', Hogan Assessment Systems, Tulsa, OK.
11. Kohavi, R., Deng, A., Frasca, B., Walker, T., Xu, Y. and Pohlmann, N. (2013) 'Online controlled experiments at large scale', in 'Proceedings of KDD '13: The 19th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, Chicago, IL, 14th–19th August', pp. 1168–1176, available at: https://dl.acm.org/doi/10.1145/2487575.2488217 (accessed 4th April, 2021).
12. Cegielski, C.G. and Jones-Farmer, L.A. (2016) 'Knowledge, skills, and abilities for entry-level business analytics positions: A multi-method study', *Decisions Sciences Journal of Innovative Education*, Vol. 14, No. 1, pp. 91–118.

APPENDIX

Table A1:   Screening analysts for types of self-directed learning

• *Induced SDL projects:*
— If we hired you, what would be your process for learning about the business and the data you will be analysing?
    ⸽ Candidate provided examples demonstrating the expectation to conduct his/her own self-directed research rather than an expectation to learn through guided learning opportunities.
    ⸽ Candidate recognised that there is much to learn about a new company and its data.
    ⸽ Candidate acknowledged that learning the business and its data are important to the success of an analyst.

• *Synergistic SDL projects:*
— Tell me about a programme or statistical technique you learned to keep your skills fresh or to prepare for job advancement.
    ⸽ Candidate was able to provide examples of learning recent analysis techniques and/or programmes.
    ⸽ Candidate mentioned the motivation was to do better in his/her job role rather than because it was required by his/her employer.

• *Voluntary SDL projects:* — Tell me about a programme or statistical technique you learned to keep your skills fresh or to prepare for job advancement.   ⸽ Candidate provided an example of learning something new, for learning's sake or for job advancement rather than because it was required in his/her job functional role.

• *Scanning SDL tasks:*
— How do you learn about latest analytics and data science trends?
    ⸽ Candidate mentioned subscriptions to relevant blogs, journals and/or podcasts.
    ⸽ Candidate belongs to relevant professional organisations.
— In your past experience, how has working with others, within your department and outside of your department, helped you as an analyst?
    ⸽ Candidate acknowledged that learning can come from cross-pollination of ideas.

Table A2: Screening analysts for the self-directedness trait

• *Responsibility vs blaming*
— Tell us about your proudest professional accomplishment
    ⸽ Candidate relates a sense of ownership and responsibility.
    ⸽ Candidate was driven by internal vs external factors.
— Talk about the last important thing that you learned.
    ⸽ Candidate relates a story that shows self-direction of the learning event vs indicating extrinsic motivation.
    ⸽ Candidate discussed exploration further than directed.
    ⸽ Candidate was excited and enthusiastic about learning.
— Describe a time you saw a problem at work and took the initiative to correct it yourself.
    ⸽ Candidate shows initiative, responsibility and resolve.
    ⸽ Candidate easily relates a sense of responsibility.

• *Purposeful vs lack of goal direction*
— Tell me about a time you set a goal for yourself. How did you go about ensuring that you would achieve it?
    ⸽ Candidate was self-directed in how they set the goal.
    ⸽ Candidate eventually achieved the goal by overcoming obstacles.
— Talk about a time when you needed information from someone that was not responsive. What did you do?
    ⸽ Candidate conveys in their answer that they were fixated on the objective and not the conflict.
    ⸽ Candidate relates that they resolved the issue in a self-directed manner vs needing assistance.

• *Resourcefulness vs inertia*
— Give an example of a time when you needed to be creative at work (or in class). What was exciting or difficult about it?
    ⸽ Candidate demonstrates excitement about the challenge.
    ⸽ Candidate relates that they learned something from the challenge.

• *Congruent second nature vs bad habits*
— Give an example of a time you faced conflict while working on a team. How did you handle it?
    ⸽ Candidate focuses on the conflict itself vs on the solution to the conflict.
    ⸽ Candidate seems to take accountability for diffusing the conflict and learning from it vs placing blame on the other party or circumstance.
— Talk about a time when you wish you had handled a situation differently with a colleague.
    ⸽ Candidate takes accountability for the bad situation vs placing blame on the other party.
    ⸽ Candidate relates that they learned something during the process.