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Likelihood of observing transformative learning amongst profession changers: a predictive analysis

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Abstract: In this paper, we explore the possibility of whether the likelihood of observing transformative learning may be predicted using information related to personal history and current and previous professions. We examine empirical data collected from a group of Indian profession changers using a machine learning method: random forest algorithm. Results indicate that the following variables play an important role in prediction: 'overall formality (previous profession)', 'community sanction (previous profession)', 'professional authority (current profession)', 'bridge course', and 'gender'. Additionally, this provides empirical support to the position that profession change may have a transformative effect. A discussion and a list of areas for further research are provided.

Keywords: transformative learning; profession change; career change; machine learning; prediction.

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1 Introduction

Tales of profession change often evoke wonder and critical thought. For instance, before turning to professional acting, Morgan Freeman served in the United States Air Force for four years with the aspiration of becoming a fighter pilot. Similarly, British politician Theresa May worked in a Bank for more than five years before entering politics (Wallenfeldt, 2020). This study was inspired by the thought that in addition to occupational change, such a transition could also cause personal transformation (Snyder, 2011; Terblanche, 2019; Negi and Jain, 2021a).

This study explores the possibility that information related to personal history and current and previous professions could be employed to predict the likelihood of observing transformative learning (TL) amongst profession changers. For this purpose, we used the data obtained from 'profession formality index' and 'habits of mind scale' studies (Negi and Jain, 2021b; Negi, 2022). We examined this dataset using the 'random forest algorithm' (RFA) and observed an acceptable level of classification (Cutler et al., 2012; James et al., 2013). Results indicate that the following variables play an important role in prediction: 'overall formality (previous profession)', 'community sanction (previous profession)', 'professional authority (current profession)', 'bridge course', and 'gender'.

The remaining of this paper is organised into four major sections. The next section provides an overview of the conceptual foundation on which this work stands. Then, we describe the research methodology employed to achieve the objective. Subsequently, we list and discuss the results. Finally, we conclude by pointing out the main contributions and some areas for future research.

2 Conceptual background

This section provides a commentary on the concepts and tools used to achieve the objective of this study. We begin by explaining the idea of 'profession' and the phenomenon of profession change. Then, we describe the 'profession formality' index: the instrument employed for comparing previous and current professions in this study (Negi, 2022). Subsequently, we present an overview of Mezirow's conception of TL before exploring the transformative dimensions of profession change. We conclude by describing the 'habits of mind scale': the instrument used in this study for gauging the extent of TL experienced by profession changers (Negi and Jain, 2021b). Notably, these studies were connected as they drew primary data from the same set of profession changers.

2.1 Profession: a conceptual revisit

Before conceptualising profession change, it may be prudent to begin with the idea of 'profession'. Interestingly, profession is not a new concept, but it is still difficult to describe without employing words like work, vocation, and occupation (Pellegrino, 1983; Barker, 1992; Christensen, 1994). For example, the Cambridge Online English dictionary defines profession as 'any type of work that needs special training or a particular skill, often one that is respected because it involves a high level of education'. Gandhi (1983) argued that a description of a profession might either take an 'attributional' or a 'processual' approach. The former involves characterisation for description or

comparison (Greenwood, 1957; Storr, 1976; Abbott, 1988; Miles, 2019). However, the latter is focused on the emergence of a profession from an occupation (Grice, 2002; Yee, 2009; Rushton, 2013).

Multiple indirect approaches to conceptualisation are seen in the literature. For instance, one may compare a professional's characteristics with those of a non-professional (Klass, 1961; Moline, 1986; Abbott, 1988; Flexner, 2001; Tapper and Millett, 2015). Studies dedicated to 'maturity of a profession' too are informative since they often compare professions or examine the evolutionary history of a profession (Smith, 1957; McCully, 1962; Bedeian, 2004; Thornton, 2011). Similarly, the study by Negi (2022) describes their attributional approach to create a new tool for measurement of the perceived extent of profession formality. This study builds on the idea that the formality of a profession refers to orderliness or systematisation, and lower levels of formality may indicate unstandardised affairs.

2.2 Profession change

Profession change has interested career theorists for a long time. For instance, from a causal point of view, Ibarra (2004) remarks that there could be three main reasons for profession change:

a envisioned identity becoming inconsistent with present identity

b role of the social network

c occurrence of triggering life events.

A new identity evolves interactively due to demands of role and self. Also, a social network may not just bring opportunities or hinder the transition but also provide role models for inspiration or navigation. In fact, there may be some evidence that highly diverse social networks facilitate profession change. Finally, a triggering event stimulates critical reflection and, in some cases, consideration for profession change (see also: Oleski and Subich, 1996; Williams, 2010). However, being dissatisfied with the current profession and finding another profession attractive may not be a sufficient condition for transition because there could be obstacles to change (Neapolitan, 1980).

Many times, profession changers do not begin with a clearly laid out plan for transition. For some, even the choice of a new career may not be straight. The psychological and monetary effects and settlement issues born out of such a transition may also pose challenges. Hence, it is recommended that profession changers keep a confident and optimistic approach towards the future and be committed to change because it might increase control over their career situations. Further, the facilitative role of social and instrumental support has also been recognised by career theorists. It is known to be useful in dealing with stress and strain encountered during the transition (Doehrman, 1982; Super, 1990; Heponiemi et al., 2009; Brown et al., 2012; Terblanche, 2019).

2.2.1 Comparing previous and current professions

We chose 'profession formality index' by Negi (2022) as one of the data sources due to its alignment with the objective of this study. This index offers an attributional approach to compare previous and current professions of a profession changer. It gauges the

perceived extent of formality of a profession through five attributes: 'systematic theory', 'ethical codes', 'professional culture', 'professional authority', and 'community sanction' (see Table 1). For operational purposes, these five attributes and an additional construct: 'overall formality', were modelled as formatively measured latent variables. The measurement and structural models were evaluated for statistical significance using the partial least squares – structured equation modelling (PLS-SEM) methodology. For the purposes of our study, we followed Negi's recommendation of using latent variable scores calculated by the simple mean method.

Table 1 Attributes of profession

Attribute	*Short description*
Systematic theory	Theoretical foundation that provides the rationale for operations
Authority	Authority over professional matters due to specialised education
Community sanction	The extent of societal acceptance of the authority of professionals
Ethical codes	Codes to facilitate criticism and treatment of misconduct
Professional culture	A unique culture belonging to a professional community

Source: Greenwood (1957)

2.3 Transformative learning

Extant literature supports the thought that the phenomenon of 'profession change' could provide an avenue for studying TL (Cranton, 2006; Taylor, 2008; Snyder, 2011; Negi and Jain, 2021a). In contrast with studies from the domain of career theory, TL studies view profession changers as socially situated learners. The TL literature also acknowledges the complex, uncertain, and tumultuous nature of such a transition. This highlights the need for supporting profession changers by fostering TL (Snyder, 2011; Rakesh, 2019; Terblanche, 2019; Negi and Jain, 2021a).

Mezirow (2003) defined TL as: "learning that transforms problematic frames of reference – sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets) – to make them more inclusive, discriminating, open, reflective, and emotionally able to change". It must be noted here that Mezirow (1981, 1991) built his theory on the premise that 'critical reflection' is the tool for transformation in adulthood (see also: King and Kitchener, 1994; Kegan, 2009). Mezirow's TL process is usually depicted as a linear, ten or eleven-step process that begins with a 'disorienting dilemma' and ends with 'societal reintegration' (Cranton, 2006; Calleja, 2014; Nohl, 2015).

The centrality of 'frames of reference' in Mezirow's (2003) definition is notable. A frame of reference is a structure of assumptions used for meaning making, and it has two dimensions: 'habits of mind' and 'points of view' (Mezirow, 1997; Gunnlaugson, 2007). Habits of mind may be understood as abstract ways of thinking which could be observed via points of view. Interestingly, it is an unchallenged habit of mind that creates ground for transformation. Common reasons for the emergence of an unchallenged habit of mind are: 'language-based assumptions', 'selective perception', 'survival needs' and 'constrained vision of humanity' (Mezirow, 1991; Cranton, 2006). Mezirow (2000) described six types of habits of mind: aesthetic, epistemic, moral-ethical, philosophical, psychological, and sociolinguistic (see Table 2).

Table 2 Six types of habits of mind

Type of habit of mind	*Description*
Aesthetic	The way beauty is understood; considerations and standards related to beauty relate to this type
Epistemic	Related to (conceptualisation of) knowledge and the way it is acquired; individual differences and preferences in learning also belong here
Moral-ethical	Help conceptualise ideas related to conscience and morality
Philosophical	Based on spiritual, philosophical, religious beliefs or values
Psychological	Related to the way people see self, needs, anxieties, desires, etc.; often formed due to experiences in the childhood
Sociolinguistic	The way sociocultural norms and expectations are conceptualised; ideas related to diversity and inclusion owe primarily to this category

Source: Mezirow (2000) and Cranton (2006)

In contrast and unfortunately, the Mezirow centric literature of TL lacks a clearly articulated definition and conceptualisation of 'point of view'. For example, Mezirow (1997) did not define but described that points of view change continuously with reflection. However, more importantly, he noted that it is easier to be conscious of the point of view as compared to the respective habits of mind that one is taking or using. Similarly, Cranton (2006) limited herself to suggesting that a point of view is a collection of meaning schemes. Gunnlaugson (2007) too stayed succinct and called a point of view as an outward perspective to a life situation or a circumstance.

2.3.1 Transformative effect of profession change

The study by Negi and Jain (2021a) presents a framework to explain the transformation of a profession changer. It visualises the TL process as a six-phase linear process whereby profession changer is viewed as a transformative learner. However, it does not rule out the possibility that due to certain considerations and/or barriers, learners may not follow the process properly or completely. Inspired by the work of Mezirow and Ibarra (2004), Negi and Jain (2021a) hold that such a journey may begin due to certain disorienting events which create mental dissonance. Only after the learner accepts the existence and influence of such a mental state, contemplation regarding resolution begins. Usually, learners generate multiple options for resolution and use a mental method of their own making to select the preferred ones. Planning for action and learning follows this. However, in some cases, settlement in the new profession is tightly interwoven with learning endeavours. Negi and Jain (2021a) also note that such a transition is socially situated, and social network and the environment are crucial to successful resettlement.

In contrast, Rakesh (2019) describes the discovery and seeking approaches of profession changes and argues that there are factors and resources which act as enablers, legitimisers, and drivers while facilitating or regulating a journey. Snyder (2011) comes from a facilitative perspective and recognises that such a transition could be tumultuous but argues that any assistance for profession changers must be built on a deep understanding of their journey. In this regard, the transformative transition coaching framework (TTC) by Terblanche (2019) may be a useful contribution for fostering TL in leadership transition coaching. The TTC framework recognises the need for instrumental

and social support and provides contours and boundaries for crafting strategies and interventions (see Table 3).

Table 3 Seven aspects of the TTC framework

Aspect	*Description*
Contextual	Context and focus of intervention must facilitate transformative learning
Contractual	A contract should be used to manage expectations and to guide the intervention
Anticipatory	The goals related to transitional challenges must be mutually agreed upon and noted
Temporal	Relates to timing and duration of the intervention
	Early start and prolonged engagement recommended
Technical	Tools and techniques of coaching
Efficacious	The extent to which transformative learning was experienced
	Hoggan's (2015) three aspect criteria may be used
Procedural	Five stages: initiate, understand, identity and design, reflect and redesign, complete
	Include Mezirow's (1994) conceptualisation of perspectives and reflection
	Include Hoggan's (2015) three aspect criteria for transformative learning

Source: Terblanche (2019)

2.3.2 Measurement of TL in the context of profession change

While sophisticated and diverse approaches to 'measurement of TL' have now emerged, it remains a complex and contentious issue. Some of this may be attributed to the constructivist nature of TL and some to the existence of many competing conceptualisations of TL (Taylor, 2006; Hoggan, 2015; Cheney, 2010; Stuckey et al., 2014; Brock, 2015).

We chose the 'habits of mind scale' study by Negi and Jain (2021b) as the second data source. This study describes a collection of scales to observe the change in six types of habits of mind of profession changers. Operationally, six kinds of habit of mind were modelled as reflective constructs and examined using exploratory factor analysis (EFA) to discover 11 latent factors (see Table 4). The reliability of all the factors was examined using Cronbach's alpha and McDonald's omega (range: 0.725–0.728). Further, average variance explained (AVE) and heterotrait-monotrait (HTMT) ratio were used to establish the convergent and discriminant validity, respectively. Since all the AVE values were found equivalent or greater than 0.5 and all the HTMT ratios were less than 0.85, this was interpreted as a sign of acceptable levels of validity. Finally, we extended the recommendation by Negi and Jain regarding 'factor-based scales' and calculated a singular measure for the extent of TL using the 'average of averages' method. Confidence in usage of 'average of averages' method was also based on the following two observations:

a All the factors were extracted using the same oblique rotation method: oblimin.

b The overall reliability coefficients for the scale were found to be acceptable (Cronbach's alpha: 0.802 and McDonald's omega: 0.811).

Table 4 Habits of mind scale: list of factors

Habits of mind	*Factors*
Aesthetic	Concept of beauty; aesthetic distance from society
Epistemic	Epistemic habits of mind
Moral-Ethical	Moral-ethical locus of control; conscious social behaviour
Philosophical	Personal philosophy; spiritual view
Psychological	Concept of self; understanding of inner fears
Sociolinguistic	Concept of social power; understanding of sociolinguistic traps

Source: Negi and Jain (2021b)

3 Method

The objective of this work was to see if the likelihood of observing TL in a profession changer could be predicted using information related to personal history and previous and current professions. This was achieved by secondary data analysis through appropriate computational methods. Our approach is described in the following three subsections. The first subsection is dedicated to the acquisition and management of data; the second describes the method used to select a tenable model; the final one presents a commentary on our method of choice for analysis.

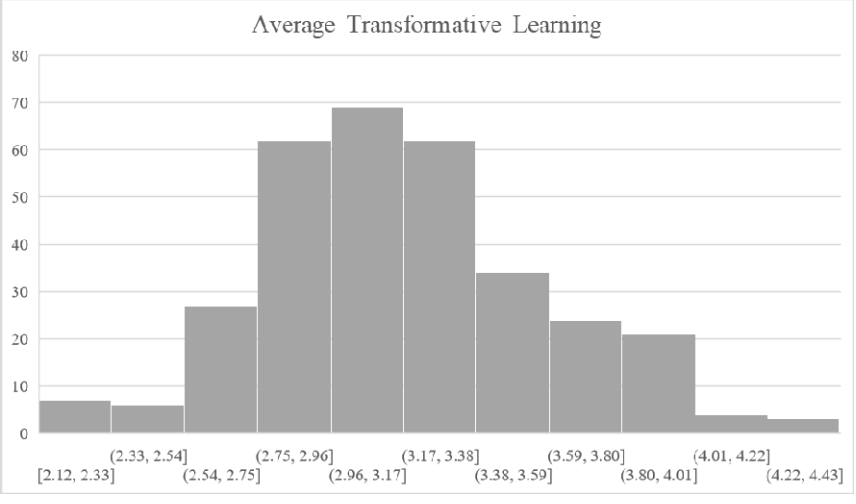
3.1 Data acquisition and management

As explained earlier, we selected 'habits of mind scale' and 'profession formality index' studies as data sources and created a new dataset by combining these studies' outcomes (henceforth referred to as: 'the dataset'). We also recall that these studies collected data from the same set of profession changers (Negi and Jain, 2021b; Negi, 2022). Structurally, the dataset contained 319 rows and 25 columns wherein every row represented a study-participant record, and every column represented a variable. In particular, Negi (2022) contributed twelve variables that helped compare the perceived extent of formality of previous and current professions of the study participants. This comparison served as a proxy for profession change. Similarly, Negi and Jain (2021b) contributed one variable as a singular representation of TL's extent due to profession change. The remaining twelve variables contained study participants personal history information, and all of these variables were common to Negi (2022) and Negi and Jain (2021b) studies. Overall, there were no missing values in the dataset (see Appendix: Table A1).

In the simplest sense, this study was concerned with the thought: 'when does profession change lead to TL?'. Operationally, this meant that the variable obtained from Negi and Jain (2021b) should be treated as the dependent/predicted variable. We also saw merit in recoding this variable as a binary variable with two levels: 'low' and 'high' (where 'low' indicates less likelihood of observing TL in a profession changer and vice versa) for the purposes of interpretability. However, before recoding, a histogram was plotted for visual inspection (see Figure 1). Observing the skewness, it was decided to use the median value as the threshold for segregation and recoding. All the remaining

variables in the dataset were used in their original format (see Appendix: Table A1 for the list of all variables in the dataset). Finally, since this secondary study drew from sources that use the same theoretical conception and empirical considerations, we did not face any issues related to data concordance.

Figure 1 Histogram showing distribution of average levels of transformative learning*



Source: *Data obtained from Negi and Jain (2021b)

3.2 Model selection

After considering the objective of this study and the dataset, our thought was to see if a parsimonious and useful model with tenable prediction performance could be selected using the dataset. Hence, we utilised the Boruta algorithm to examine the relative importance of all the non-dependent variables in the dataset. This operation resulted in the labelling of three variables as 'confirmed important' and two as 'tentatively important'. The remaining nineteen variables were found to be 'confirmed unimportant' (Kursa and Rudnicki, 2010). Figure 2 illustrates these results through colour codes:

a green: confirmed important

b yellow: tentatively important

c red: confirmed unimportant

d blue: shadow variables generated by Boruta algorithm [(see also: Tables 6(a) and 6(b)].

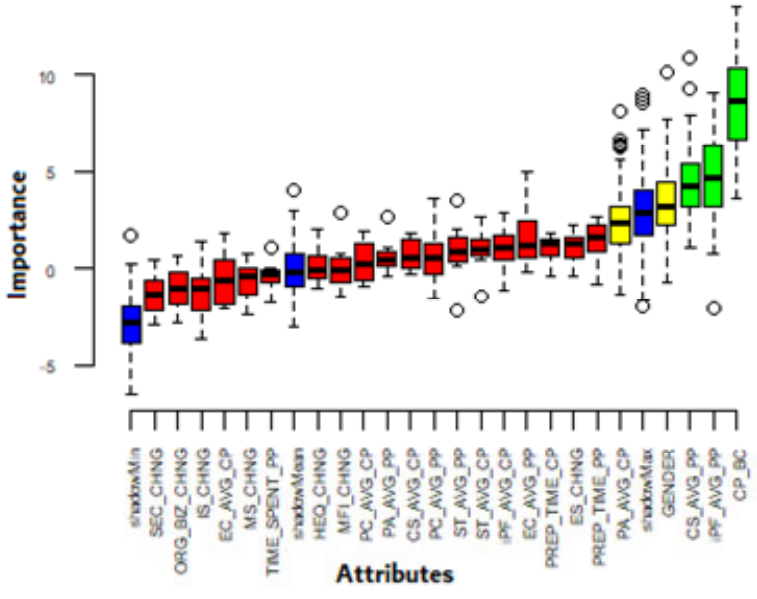
Subsequently, the results of the Boruta algorithm were used to select a model with six constituents:

a Independent/predictor variables: 'bridge course', 'overall formality (previous profession)', 'community sanction (previous profession)', 'gender' and 'professional authority (current profession).'

b Dependent/predicted variable: 'TL'. Table 5 presents a short description of the constitution of the model, and Figure 3 illustrates the model pictorially.

Additionally, for the information of interested readers, we have provided results of data analysis sans Boruta algorithm in Tables 6(a) and 6(b) to illustrate the advantage.

Figure 2 The relative importance of variables as identified by the Boruta algorithm (see online version for colours)



Source: See also Appendix Table A1

Figure 3 A visual representation of the selected model

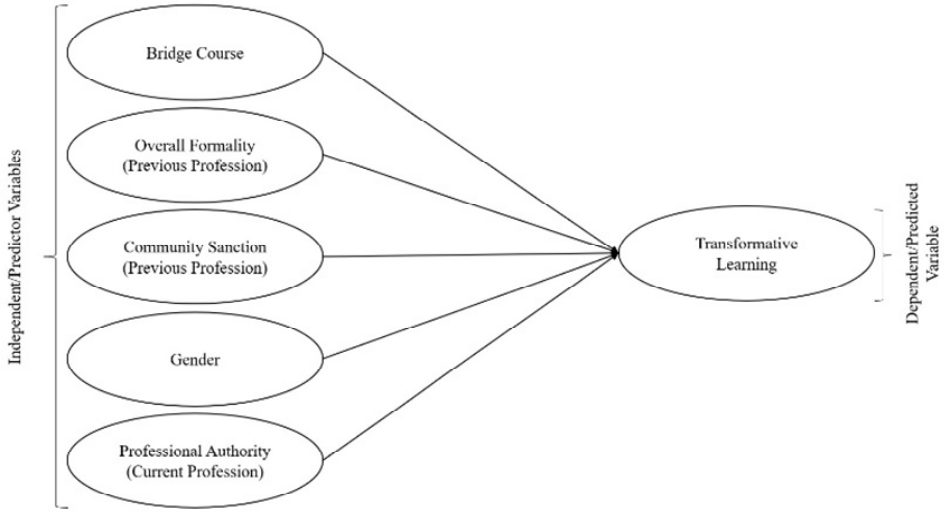


Table 5 Variables selected for inclusion in the model using the Boruta algorithm

Variable/type	*Short description of variables*
Dependent/predicted variable	
Transformative learning	Likelihood of observing TL in a profession changer
Independent/predictor variables	
Confirmed important	
Bridge Course	Whether the profession changer underwent any structured learning course: whether formal or non-formal
Overall formality (previous profession)	The extent of overall formality of the previous profession
Community sanction (previous profession)	The degree to which the community at large accepts the authority of the previous profession
Tentatively important	
Gender	Gender of the profession changer
Professional authority (current profession)	The degree to which the professional enjoys authority over matters of current profession

3.3 Analysis using RFA

This analysis situation may be construed as a 'classification' problem since it involves a categorical dependent variable, (i.e., TL). So, after conducting a preliminary review of available methodological options for analysis, with due consideration to constraints, we selected the RFA owing to its statistical and computational benefits. This algorithm is a decision tree-based, ensemble machine learning technique that improves the idea of bagging algorithms (Breiman, 2001; Biau, 2012; Cutler et al., 2012; James et al., 2013). All the computational tasks were accomplished using the R programming language in conjunction with relevant library packages (R Core Team, 2013).

We evaluated the model by conducting RFA in three steps:

a segregating the sample into 'training' and 'test' sub-samples (ratio: 75%:25%)

b training the model

c predicting values of 'test sample' using the trained model.

After the conclusion of the algorithm, five measures were used to assess the results:

- Accuracy
- Precision
- Recall
- F1 score

- Area under curve (AUC) statistic for the receiver operating characteristic (ROC) plot.

The first four measures were calculated using the confusion matrix generated after step (c). However, the ROC plot and the AUC statistic were generated computationally. We also drew the variable importance plot (based on the idea of Gini impurity) using a suitable R language library function (Breiman, 2001; Breiman et al., 2018; Cutler et al., 2012; Wang et al., 2019; Robin et al., 2020).

It may be noted here that in addition to RFA, we conducted binary logistic regression (BLR) – a statistical method often used for predicting a dichotomous categorical variable (Harrell, 2015). However, when results were compared, the RFA approach was found better than BLR, thereby fortifying belief in the method of choice (see Tables 6(a), 6(b) and A1.2).

4 Results and discussion

In this section, we begin with a brief description of the sample's composition and then discuss the results of the data analysis.

4.1 Sample profile

As conveyed earlier, the dataset used in this study was obtained and repurposed from Negi (2021) and Negi and Jain (2021b) (see Appendix: Table A1). The sampling unit for this dataset was 'profession changer', whereby 319 participants contributed through a structured questionnaire. Readers may note that the statistics presented in the following paragraph are approximate.

The gender ratio of this sample was 70% men to 30% women. 30% of the participants saw a change in their marital status after/during the transition. 87% claimed to not have witnessed any change in their socioeconomic status; this is interesting because 56% of members of this set said they saw a change in their monthly family income, and 66% of participants admitted that they gained a new educational or professional degree/qualification. Further, the average tenure in the previous profession was found to be 7.5 years. 90% of the participants had to move to a different employer; 6% started or changed their business, and the rest were able to change within the organisation. Finally, 85% moved to a different industrial sector, and 16% had to switch over to employment in a different economic sector.

4.2 Results of the RFA

Conclusion of the RFA procedure yielded three main outputs:

a performance metrics

b ROC plot

c variable importance plot.

Tables 6(a) and 6(b) list the statistics belonging to set (a); Figures 3 and 4 represent the pictorial outputs for (b) and (c). Further, for the interested readers, the results of BLR are presented in the appendix section [see Appendix: Tables 6(a) and 6(b)].

The computed values of 'accuracy', 'precision', 'recall', 'F1 score' for the RFA approach describe the tenable classification capabilities of the model. However, we relied on the AUC statistic obtained from the ROC curve as a singular metric to adjudge the overall performance of our model. In this study, the AUC statistic for the RFA approach was found to be in the 'acceptable' or 'fair' zone [see Figure 4 and Table 6(b)]. In comparison, the AUC statistic for the same model – when evaluated through BLR, may be deemed 'poor' [see Table 6(b)] [Tape, n.d.; Hosmer et al., (2013), pp.177; Harrell, 2015]. Hence, we inferred that the RFA approach is advantageous as analysis methodology.

Figure 4 ROC plot (see online version for colours)

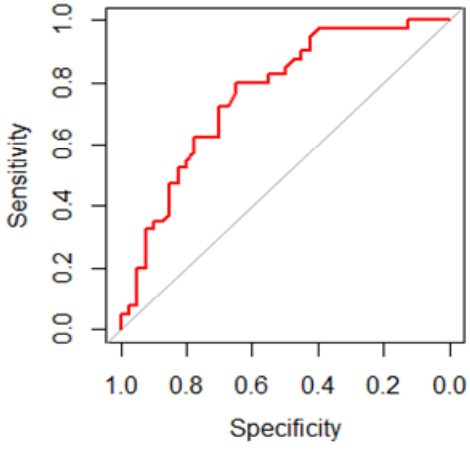
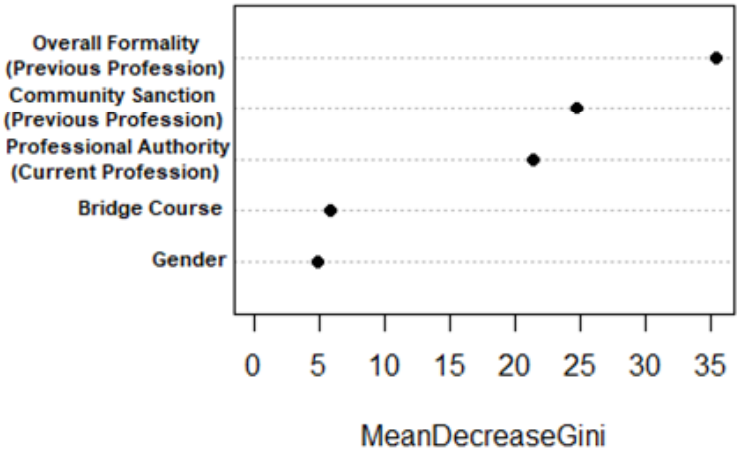


Figure 5 Variable importance plot generated after the conclusion of the random forest algorithm



The 'variable importance plot' generated using the RFA model revealed that 'overall formality (previous profession)' is the most important variable. It is followed by 'community sanction (previous profession)', 'professional authority (current profession)', 'bridge course' and 'gender' variables – respectively (see Figure 5 and Table 5).

4.3 Discussion

Lifestyle and work habits acquired during professional work are known to create adjustment issues post exit (Singh, 1985; Stephan, 2003). Such habituation may lead to resistance when faced with the eventuality of profession change (Williamson, 2003; Illeris, 2004; Hergenhahn and Olson, 2008; Suto, 2009). This is interesting because the information contributed by the 'overall formality (previous profession)' variable partially represents the professional context of the previous profession. However, the exact nature of the relationship between the difference in the formality of current and previous professions with the extent of TL remains to be seen.

Interestingly, Ibarra (2004) argued that profession change might lead to a change in identity. This is a relevant thought when one considers the 'community sanction (previous profession)' variable since it may be argued that the degree of societal respect enjoyed by a profession is likely to be a factor while considering profession change (Williamson, 2003). Further, it is well accepted that settlement in a new profession requires learning new knowledge. Williamson (2003) argues that such learning also impacts personal epistemological beliefs. Therefore, it might be prudent to believe that the formation of a new identity may be partly dependent on the extent to which the profession changer was able to gain authority over professional matters due to specialised education (see also: Cranton, 2006).

The idea behind the 'bridge course' variable represents the value of new learning as a counter to habituation and as a tool for resettlement. In the dataset, we observed that TL is relatively less likely to be observed amongst those who did not take such a learning course. We also noticed that women participants in our study were very likely to exhibit TL had they taken a learning course (see Appendix: Figure A1). It has also been argued that integration of mechanisms for social and instrumental support with bridge course could facilitate a transition (Alhassan, 2012; Sullivan and Al Ariss, 2019). Given these observations, we note that the 'Gender' variable not just adds to the predictive power but also paves the way for studies aimed at particular gender groups (Bukodi et al., 2012).

Table 6(a) Results of analysis: confusion matrix*

Random forest analysis with model selection using Boruta algorithm			*Random forest analysis without model selection*			*Binary logistic regression analysis with model selection using Boruta algorithm*†		
Predicted	*Reference*		*Predicted*	*Reference*		*Predicted*	*Reference*	
	High	*Low*		*High*	*Low*		*High*	*Low*
High	25	11	High	22	16	High	17	29
Low	15	29	Low	18	24	Low	23	11

Notes: *'Random forest analysis with model selection using Boruta algorithm' was the preferred method.
†See also: Appendix Table A2.

Table 6(b) Results of analysis: performance metrics*

Random forest analysis with model selection using Boruta algorithm		*Random forest analysis without model selection*		*Binary logistic regression analysis with model selection using Boruta algorithm*†	
Performance metric	*Values*	*Performance metric*	*Values*	*Performance metric*	*Values*
Accuracy	0.675	Accuracy	0.575	Accuracy	0.35
Precision	0.6944	Precision	0.5789	Precision	0.3696
Recall	0.625	Recall	0.55	Recall	0.425
F1 Score	0.6578	F1 score	0.5641	F1 score	0.3953
AUC statistic for ROC plot	0.7472	AUC statistic for ROC plot	0.6419	AUC statistic for ROC plot	0.6841

Notes: *'Random forest analysis with model selection using Boruta algorithm' was the preferred method.
† See also: Appendix Table A2

Importantly, the results also imply that it may be possible to predict the likelihood of observing TL amongst profession changers. This would require combining personal history information with information related to previous and current professions.

5 Conclusions

The objective of this study was to see if the likelihood of observing TL in a profession changer could be predicted by using information related to personal history and previous and current professions of a profession changer. For this purpose, we employed the RFA to observe that the following five variables exhibit reasonable classification performance: 'overall formality (previous profession)', 'community sanction (previous profession)', 'professional authority (current profession)', 'bridge course' and 'gender'. This result provides an empirically supported rationale for future studies that aim to investigate the transformative effect of profession change. To the best of our knowledge, this is a unique contribution: methodologically and result-wise.

Researchers who intend to extend this work may consider examining supportive/contradictory evidence for the causal relationship between profession change and TL. In fact, studies that use large datasets collected through probabilistic sampling techniques could add tremendous empirical value to this pursuit. Further, since we used median value to split and recode the dependent variable as a binary variable, it will be interesting to see how results change if measures like mean and quartiles are used for such a conversion. Also, a revalidation of Negi's (2022) index involving redundancy analysis may require revision of the current study. On a different note, observing the transformative effect of profession change across diverse sociocultural contexts to discern patterns could also be interesting. The issue of 'learner satisfaction' also remains to be explored better since such studies could help identify practices for fostering TL amongst profession changers.

However, from a utilitarian perspective, the results of this study may provide some support and guidance to business organisations interested in instituting assistance

programmes for job candidates who are trying to resume work after taking a career break (Amazon, n.d.; Mehta, 2016).

References

Abbott, A. (1988) *The System of Professions: An Essay on the Division of Expert Labor*, University of Chicago Press, Chicago.

Alhassan, A.M. (2012) 'Factors affecting adult learning and their persistence: a theoretical approach', *European Journal of Business and Social Sciences*, Vol. 1, No. 6, pp.150–168.

Amazon (n.d.) *Rekindle Program: A Return to Work Program for Women Who Have Taken a Break in Their Career* [online] https://www.amazon.jobs/en/landing_pages/rekindle (25 May 2021).

Barker, S.F. (1992) 'What is a profession?', *Professional Ethics, A Multidisciplinary Journal*, Vol. 1, Nos. 1/2, pp.73–99.

Bedeian, A.G. (2004) 'The gift of professional maturity', *Academy of Management Learning & Education*, Vol. 3, No. 1, pp.92–98.

Biau, G. (2012) 'Analysis of a random forests model', *The Journal of Machine Learning Research*, Vol. 13, No. 1, pp.1063–1095 [online] https://www.jmlr.org/papers/volume13/biau12a/biau12a.pdf.

Breiman, L. (2001) 'Random forests', *Machine Learning*, Vol. 45, No. 1, pp.5–32.

Breiman, L., Cutler, A., Liaw, A. and Wiener, M. (2018) *randomForest: Breiman and Cutler's Random Forests for Classification and Regression (v4.6–14)*, (Computer program) [online] https://www.rdocumentation.org/packages/randomForest (accessed 30 August 2022).

Brock, S. (2015) 'Let's spread the word about the wisdom of transformative learning', *Journal of Transformative Learning*, Vol. 3, No. 1, pp.18–21.

Brown, A., Bimrose, J., Barnes, S.A. and Hughes, D. (2012) 'The role of career adaptabilities for mid-career changers', *Journal of Vocational Behavior*, Vol. 80, No. 3, pp.754–761.

Bukodi, E., Dex, S. and Joshi, H. (2012) 'Changing career trajectories of women and men across time' in Scott, J., Dex, S. and Plagnol, A.C. (Eds.): *Gendered Lives: Gender Inequalities in Production and Reproduction*, Edward Elgar Publishing, Cheltenham, UK.

Calleja, C. (2014) 'Jack Mezirow's conceptualisation of adult transformative learning: a review', *Journal of Adult and Continuing Education*, Vol. 20, No. 1, pp.117–136.

Cheney, R.S. (2010) 'Empirical measurement of perspective transformation, 1999–2009', *29th Annual Midwest Research-to-Practice Conference in Adult, Continuing, Community and Extension Education*, Michigan State University, East Lansing, Michigan, 26–28 September, 2010, pp.57–62.

Christensen, B.A. (1994) 'What is a profession?', *Journal of the American Society of CLU & ChFC*, Vol. 48, No. 1, pp.28–30.

Cranton, P. (2006) *Understanding and Promoting Transformative Learning: A Guide for Educators of Adults*, Jossey Bass, San Francisco.

Cutler, A., Cutler, D.R. and Stevens, J.R. (2012) 'Random forests', in Zhang, C. and Ma, Y. (Eds.): *Ensemble Machine Learning*, pp.157–175, Springer, Boston.

Doehrman, S.R. (1982) 'Stress, strain, and social support during a role transition', in Allen, V.L. and Van de Vliert, E. (Eds.): *Role Transitions: Explorations and Explanations*, Vol. 23, pp.253–262, Springer, New York.

Flexner, A. (2001) 'Is social work a profession?', *Research on Social Work Practice*, Vol. 11, No. 2, pp.152–165.

Gandhi, J.S. (1983) 'Sociology of professions in India towards a profile of relevance', *Sociological Bulletin*, Vol. 32, No. 1, pp.14–34.

Greenwood, E. (1957) 'Attributes of a profession', *Social Work*, Vol. 2, No. 3, pp.45–55.

Grice, R.A. (2002) 'Some reflections on the emergence of a profession', *ACM Journal of Computer Documentation*, Vol. 26, No. 3, pp.126–129.

Gunnlaugson, O. (2007) 'Shedding light on the underlying forms of transformative learning theory: introducing three distinct categories of consciousness', *Journal of Transformative Education*, Vol. 5, No. 2, pp.134–151.

Harrell, F.E. (2015) 'Binary logistic regression', in Harrell Jr, F.E. (Ed.): *Regression Modeling Strategies: With Applications to Linear Models, Logistic and Ordinal Regression, and Survival Analysis*, pp.219–274, Springer, Switzerland.

Heponiemi, T., Kouvonen, A., Vänskä, J., Halila, H., Sinervo, T., Kivimäki, M. and Elovainio, M. (2009) 'The association of distress and sleeping problems with physicians' intentions to change profession: the moderating effect of job control', *Journal of Occupational Health Psychology*, Vol. 14, No. 4, pp.365–373.

Hergenhahn, B.R. and Olson, H.O. (2008) *An Introduction to Theories of Learning*, 7th ed., Pearson Education, New Delhi.

Hoggan, C.D. (2015) 'Transformative learning as a metatheory: definition, criteria, and typology', *Adult Education Quarterly*, Vol. 66, No. 1, pp.57–75.

Hosmer Jr., D.W., Lemeshow, S. and Sturdivant, R.X. (2013) *Applied Logistic Regression*, 3rd ed., John Wiley & Sons, New Jersey.

Ibarra, H. (2004) *Career Transition and Change*, INSEAD Faculty & Research Working paper series 2004/97/OB [online] https://flora.insead.edu/fichiersti_wp/inseadwp2004/2004-97.pdf (accessed 30 August 2022).

Illeris, K. (2004) 'Transformative learning in the perspective of a comprehensive learning theory', *Journal of Transformative Education*, Vol. 2, No. 2, pp.79–89.

James, G., Witten, D., Hastie, T. and Tibshirani, R. (2013) *An Introduction to Statistical Learning*, Springer, New York.

Kegan, R. (2009) 'What 'form' transforms?: A constructive-developmental approach to transformative learning', in Illeris, K. (Ed.): *Contemporary Theories of Learning: Learning Theorists... In Their Own Words*, Routledge, UK.

King, P.M. and Kitchener, K.S. (1994) *Developing Reflective Judgment: Understanding and Promoting Intellectual Growth and Critical Thinking in Adolescents and Adults*, Jossey-Bass, San Francisco.

Klass, A.A. (1961) 'What is a profession?', *Canadian Medical Association Journal*, Vol. 85, No. 12, pp.698–701.

Kursa, M.B. and Rudnicki, W.R. (2010) 'Feature selection with the Boruta package', *Journal of Statistical Software*, Vol. 36, No. 11, pp.1–13.

McCully, C.H. (1962) 'The school counselor: strategy for professionalisation', in McCully, C.H. and Miller L.L. (Eds.): *Challenge for Change in Counselor Education*, pp.16–26, Burgess Publishing Co., Minneapolis.

Mehta, P. (2016) *Making a Comeback with Career 2.0* [online] https://www.genpact.com/insight/blog/making-a-comeback-with-career-2-0 (25 May 2021).

Mezirow, J. (1981) 'A critical theory of adult learning and education', *Adult Education Quarterly*, Vol. 32, No. 1, pp.3–24.

Mezirow, J. (1991) *Transformative Dimensions of Adult Learning*, Jossey-Bass, New Jersey.

Mezirow, J. (1997) *Transformative Learning: Theory to Practice*, *New Directions for Adult and Continuing Education*, Summer, No. 74, pp.5–12.

Mezirow, J. (2000) *Learning as Transformation: Critical Perspectives on a Theory in Progress*, Jossey-Bass, New Jersey.

Mezirow, J. (2003) 'Transformative learning as discourse', *Journal of Transformative Education*, Vol. 1, No. 1, pp.58–63.

Miles, E.W. (2019) *The Purpose of the Business School: Alternative Views and Implications for the Future*, Palgrave Pivot, London.

Moline, J.N. (1986) 'Professionals and professions: a philosophical examination of an ideal', *Social Science & Medicine*, Vol. 22, No. 5, pp.501–508.

Neapolitan, J. (1980) 'Occupational change in mid-career: an exploratory investigation', *Journal of Vocational Behavior*, Vol. 16, No. 2, pp.212–225.

Negi, T. (2022) 'A measure for extent of profession formality', *Int. J. of Management Concepts and Philosophy*, in press.

Negi, T. and Jain, S. (2021a) 'Transformative effect of profession change: an explanatory framework', *Journal of Transformative Learning*, Vol. 8, No. 2, pp.1–15.

Negi, T. and Jain, S. (2021b) 'Observing impact of profession change on 'habits of mind': a factor oriented approach', *Journal of Adult and Continuing Education*, https://doi.org/10.1177/14779714211042037.

Nohl, A.M. (2015) 'Typical phases of transformative learning: a practice-based model', *Adult Education Quarterly*, Vol. 65, No. 1, pp.35–49.

Oleski, D. and Subich, L.M. (1996) 'Congruence and career change in employed adults', *Journal of Vocational Behavior*, Vol. 49, No. 3, pp.221–229.

Pellegrino, E.D. (1983) 'What is a profession?', *Journal of Allied Health*, Vol. 12, No. 3, pp.168–176.

R Core Team (2013) 'R: a language and environment for statistical computing', [computer program] *R Foundation for Statistical Computing*, Vienna, Austria [online] http://www.R-project.org/ (accessed 30 August 2022).

Rakesh, S. (2019) *Transitions Out of Corporate Careers: Accounts of Individuals from India*, PhD Thesis, Indian Institute of Management Bangalore , IIM Bangalore Library.

Robin, X., Turck, N., Hainard, A., Tiberti, N., Lisacek, F., Sanchez, J,C., Müller, M., Siegert, S. and Doering, M. (2020) *pROC: Display and Analyze ROC Curves (version 1.16.2)* [Computer program] [online] https://cran.rproject.org/web/packages/pROC/pROC.pdf.

Rushton, G.T. (2013) 'From Occupation to profession: a perspective on the American association of chemistry teachers', *Journal of Chemical Education*, Vol. 91, No. 1, pp.8–9.

Singh, M.M. (1985) *Resettlement Problems of Retired Army Officers*, Mittal Publications, New Delhi.

Smith, R.A. (1957) 'Maturity of education as a profession', *Journal of Teacher Education*, Vol. 8, No. 3, pp.253–260.

Snyder, C. (2011) 'Pride badly shattered: the transformational journey of career-changing women in secondary education', *Journal of Transformative Education*, Vol. 9, No. 4, pp.242–260.

Stephan, Y. (2003) 'Repercussions of transition out of elite sport on subjective well-being: a one-year study', *Journal of Applied Sport Psychology*, Vol. 15, No. 4, pp.354–371.

Storr, E.D. (1976) 'The criteria for a profession', *Australian Surveyor*, Vol. 28, No. 2, pp.104–107.

Stuckey, H.L., Taylor, E.W. and Cranton, P. (2014) 'Developing a survey of transformative learning outcomes and processes based on theoretical principles', *Journal of Transformative Education*, Vol. 11, No. 4, pp.211–228.

Sullivan, S.E. and Al Ariss, A. (2019) 'Making sense of different perspectives on career transitions: a review and agenda for future research', *Human Resource Management Review*, Vol. 31, No. 1, p.100727.

Super, D.E. (1990) 'A life-span, life-space approach to career development', in Brown, D. and Brooks, L. (Eds.): *Career Choice and Development*, 2nd ed., Jossey-Bass, San Francisco.

Suto, M. (2009) 'Compromised careers: the occupational transition of immigration and resettlement', *Work*, Vol. 32, No. 4, pp.417–429.

Tape, T.G. (n.d.) *Interpreting Diagnostic Tests: ROC Curves: The Area under an ROC Curve* [online] http://gim.unmc.edu/dxtests/roc3.htm (accessed 30 August 2022).

Tapper, A. and Millett, S. (2015) 'Revisiting the concept of a profession', in Beard, M. and Lynch (Eds.): *Conscience, Leadership and the Problem of 'Dirty Hands'*, pp.1–18, Emerald Group Publishing, Bingley, UK.

Taylor, E. W. (2006) 'A critical review of the empirical research of transformative learning (1999-2005)', *Adult Education Research Conference 2006* [online] https://newprairiepress.org/aerc/2006/papers/52/ (accessed 30 August 2022).

Taylor, E.W. (2008) 'Transformative learning theory', *New Directions for Adult and Continuing Education*, Vol. 2008, No. 119, pp.5–15.

Terblanche, N.H. (2019) 'Transformative transition coaching: a framework to facilitate transformative learning during career transitions', *The International Journal of Human Resource Management*, Vol. 33, No. 2, pp.269–296.

Thornton, A. (2011) *British Archaeologists, Social Networks and the Emergence of a Profession*, PhD thesis, University College London [online] https://discovery.ucl.ac.uk/id/eprint/1318140/ (accessed 30 August 2022).

Wallenfeldt, J. (2020) 'Theresa May', in *Encyclopedia Britannica* [online] https://www.britannica.com/biography/Theresa-May (accessed 30 August 2022).

Wang, J., Xu, J., Zhao, C., Peng, Y. and Wang, H. (2019) 'An ensemble feature selection method for high dimensional data based on sort aggregation', *Systems Science & Control Engineering*, Vol. 7, No. 2, pp.32–39.

Williams, J. (2010) 'Constructing a new professional identity: career change into teaching', *Teaching and Teacher Education*, Vol. 26, No. 3, pp.639–647.

Williamson, R.A.D. (2003) *In Through the Side Door: A Portrait of Three Second Career Science Teachers*, PhD thesis, University of Georgia [online] https://getd.libs.uga.edu/pdfs/williamson_rachel_d_200305_edd.pdf (accessed 30 August 2022).

Yee, H. (2009) 'The re-emergence of the public accounting profession in China: a hegemonic analysis', *Critical Perspectives on Accounting*, Vol. 20, No. 1, pp.71–92.

Appendix

Table A1 List of all variables in the dataset

Variable code	*Purpose*
GENDER*†	Gender of the study participant
ORG_BIZ_CHNG*†	Whether the study participant changed their organisation or business
CP_BC*†	Bridge course
MS_CHNG*†	Change in marital status
SEC_CHNG*†	Change in Socioeconomic class
MFI_CHNG*†	Change in monthly family income
HEQ_CHNG*†	Change in highest educational qualification
IS_CHNG*†	Whether the study participant moved across industrial sectors
ES_CHNG*†	Whether the study participant moved across economic sectors
PREP_TIME_CP*†	Time taken for preparatory training of current profession
PREP_TIME_PP*†	Time taken for preparatory training of previous profession
TIME_SPENT_PP*†	Tenure of previous profession
TL_AVG†	Likelihood of observing TL in a profession changer
CS_AVG_CP*, CS_AVG_PP*	Community Sanction - current and previous profession
EC_AVG_CP*, EC_AVG_PP*	Ethical codes – current and previous profession
PA_AVG_CP*, PA_AVG_PP*	Professional authority – current and previous profession
PC_AVG_CP*, PC_AVG_PP*	Professional culture – current and previous profession
ST_AVG_CP*, ST_AVG_PP*	Systematic theory – current and previous profession
iPF_AVG_CP*, iPF_AVG_PP*	Overall formality of current and previous professions

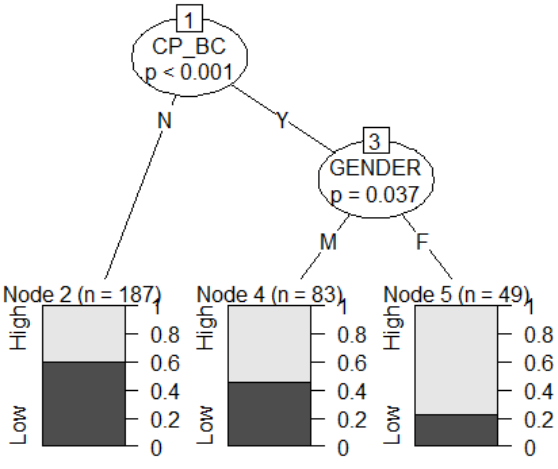
Note: †Represents data from (Negi and Jain, 2021b); *represents data from (Negi, 2022).

Table A2 Results of binary logistic regression (training sample)

Deviance residuals:				
Min	*1Q*	*Median*	*3Q*	*Max*
–1.5755	–1.1269	0.8481	1.1004	1.5037
Coefficients:				
	Estimate	*Std. error*	*z value*	*Pr(>|z|)*
(Intercept)	0.93397	1.00684	0.928	0.3536
CP_BCY	–0.7672	0.2727	–2.813	0.0049 **
iPF_AVG_PP	–0.09705	0.38954	–0.249	0.8033
CS_AVG_PP	0.05785	0.24072	0.24	0.8101
GENDERM	0.36154	0.29064	1.244	0.2135
PA_AVG_CP	–0.29909	0.18198	–1.644	0.1003

Note: Significance codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1.

Figure A1 A decision tree displaying some patterns observed in the dataset



Note: The decision tree was generated using an alpha value of 0.05 as the minimum criterion for a split.