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Development of the SLDR9 Measurement Tool and Evidence for a Second Order Latent Construct of Self-Directed Learning Readiness in Virtual Teams in Hungary

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ABSTRACT

In this paper we approach the development of virtual teams from the individuals' perspective by extending the theory of self-directed learning (SDL) beyond the extant research in nursing education and applying it to a sample of adult population working in virtual teams in Hungary. After finding the necessary theoretical steps to connect SDL with virtual teams, we conducted a study with the intent to validate existing instruments or, if this is not possible, to develop a new SDL instrument for virtual teams. Our results confirm the viability of the SDL theories in the context of teams working remotely much of the time. While we could not confirm confidently the validity of the known SDLR instruments developed for nursing education on our sample of working adults in virtual teams, we have found support for the conventional three factor self-directed learning readiness (SDLR) construct with a reduced item number. In the current paper we advance a new measurement tool called the SDLR9 which, while mirroring the three original factors known in the extant literature, also points to a higher order latent SDLR variable.

Keywords: individual learning, self-directed learning readiness, team development, virtual teams, SLDR9

JEL classification: D83, M14, M16, M53

1. INTRODUCTION

Virtual teams – especially after the onset of the pandemic – became integral parts of several organisations. Tasks and processes that companies believed could not be performed remotely were proved to be suitable to be executed away from the office, even from our own homes. However, there have been theories and academic articles about virtual teams for several decades now. As Bell and Kozlowski wrote in their famous article: "*Virtual teams are here, and they are here to stay" (Bell and Kozlowski, 2002, p. 45).*

When it comes to virtual teams, there are several aspects how team development and learning can be analysed. Such aspects can be organisational, leadership, team, individual and many more. At the individual level it should be analysed how the individual attributes and personality traits can contribute to the success of their learning, which of these influence directly the process of team development. In this paper, we are analysing how the concept of self-directed learning (SDL) and the model by Fisher et al. (2001) of SDL readiness scales (SDLSR) could be applied or adapted to virtual teams. The goal of this research is to test the results of a data collection performed in Hungary on a sample of 200 adults working in virtual teams and either confirm the applicability of the original 40-item SDLRS scale of Fisher et al. (2001) or develop our own SDLRS model through confirmatory and exploratory factor analysis and internal consistency measures.

In this article we summarize the theoretical background of virtual teams, SDL and SDLRS (Section 2-3), provide an overview about the methods of the data collection and the statistical analysis (Section 4) and present and discuss the empirical findings of our data analysis and proposed SDLRS model (Section 5-6) and provide our conclusion in (Section 7).

2. VIRTUAL TEAMS

When discussing virtual teams, first the definition of teams in the traditional sense should be introduced. Cohen and Bailey (1997) defined team as a set of individuals, who are seen as a complete social entity (e.g., department, corporation) and are jointly responsible for the outcomes of the tasks they independently perform to reach a common goal. The members are working together, they use their different skills and provide support to each other, sometimes meshing their functions to reach the goal of the team. According to Berry (2011) teams generally have four attributes, which are common amongst all teams:

- The team has a shared membership mindset, and usually has a definable and limited membership
- The team members function independently with a shared purpose – which is either constructed by the team or was given for them
- The team members are jointly responsible for the outcomes
- The team members manage their relationships across and between organisational boundaries collectively

Virtual teams have the same basic concept as traditional teams: they are a set of individuals sharing the responsibility to perform tasks as a complete social entity. However, there are two additional attributes of virtual teams, that should be added to the characteristics of traditional teams (Berry, 2011):

- The team members may be geographically dispersed
- The team members mostly rely on computer-mediated communication rather than face-to-face communication

Virtual teams do not differ from the previously introduced traditional team in their purposes or goals, only their ways of working, i.e., using IT and communication technologies and the fact that the team members are necessarily not located in the same office (in many cases not even in the same continent) or the face-to-face meetings are not necessary or possible during the execution of their tasks. (Bell–Kozlowski, 2002). The technology-mediated nature of virtual teams is present in several studies, noting that without technology teams cannot have a virtual nature (Lipnack–Stamps, 2000). (Kupa, 2020a)

The virtual nature of these teams is a complex and multidimensional construct since, even if there are two teams, using the same technology, the extent to which the technology is used defines which of them (if either) can be considered as a virtual team. Nowadays every team uses technology to a certain extent. Emails and other video and chat applications have become significant communication tools in almost all teams. Thus, for the sole reason that a team uses

emails and Zoom, the virtual nature cannot be defined as these could also define a team that conducts only certain activities virtually – i.e., uses emails for tracking purposes, chats in the loud office, etc. This means that almost every team adopts some virtualness in its nature, but for the purposes of qualifying as a virtual team, technology is not enough - without the geographical dispersion these teams cannot be considered virtual. (Berry, 2011; Kupa, 2020a)

The past two decades have brought significant growth in the use of virtual teams, with its peak being reached in 2020 due to the coronavirus pandemic. According to Gartner (2020) 88 per cent of global organisations encouraged their employees to work from home since the beginning of 2020, irrespective of whether they were affected by the virus or not. 97 per cent of organisations made arrangements to cancel business related travel, thus making it impossible to conduct face-to-face meetings in virtual teams. Bakonyi and Kiss-Dobronyi (2020) conducted a survey in Hungary, where 73 per cent of the participants responded that they had been asked by their employers to work from home for a certain period of time. This shows that the significance of virtual teams has increased even further, however longer-term effects of the COVID19 peaks is yet to be determined. What can be seen is that despite of the current pandemic, the number of virtual teams deployed by companies have been growing for some time due to globalisation, innovation and better access to infrastructure.

There are several reasons why companies opted for setting up virtual teams within their organisations. The benefits arising with virtual teams are, amongst others, flexibility, cost efficiency, better utilisation of time and space, and maximising expertise of the globally dispersed talent pool. At the same time, these benefits pose several challenges to teams, such as overcoming a lack of personal connections, different cultural backgrounds, language barriers and technological issues (Kupa, 2020a). The leader's role is to help the team overcome these challenges and, at the same time, exploit the benefits and opportunities. Besides these, the focus of the leaders should be on performance management and team development and learning. However, due to the lack of face-to-face interactions, the latter is difficult to perform (Bell and Kozlowski, 2001) and requires the willingness and positive attitude of the individual team members.

Learning is part of all stages of team development, however, it is often hindered when using various virtual tools for communication that is present in virtual teams. Zakaria et al. (2004) noted that since learning is not purely based on verbal or written communication, the lack of face-to-face contact, i.e., the limited number of non-verbal clues decreases the chance of success of the team's learning activities. In this sense, the individuality becomes even more significant in virtual teams when it comes to learning – the individuals have to be ready and able to search for and process information independently and, at the same time, effectively. The self-directed learning readiness – as discussed in the next chapter – is a good indicator to assess this individuality and – if adapted correctly – could help leaders in developing efficient teams.

3. SELF-DIRECTED LEARNING

3.1. Self-Directed Learning theories

Learning is a major focus of several disciplines, however, there is a difficulty in establishing a single satisfactory definition due to the different perspectives each discipline adopts. The most common definition describes learning as a change in behaviour due to previous experiences. (Barron et al., 2015) In organisations and teams, this is not different: former experience can be decisively present in online training, or in reading books, talking to co-workers or solving problems and finding the solutions.

In the case of virtual teams, the limitations of learning are due to the lack of face-to-face contact. Although more explicit knowledge is easier to pass on, learning often draws on tacit knowledge, which, thus, is much more challenging. Due to these limitations, there is a growing need in virtual teams for individuality and independency when it comes to learning. Self-

directed learning (SDL) and self-regulated learning (SRL) focus on how the individuals approach their individual learning, what strategies they set, and how they manage their own learning. In this study the term SDL will be used to describe this phenomenon. (Kupa, 2020b)

SDL is defined by these learning strategies individuals take to achieve their learning goals. This includes identifying and assessing their training and learning needs, setting objectives, evaluating their performance and the outcomes of their learning activities. In SDL individuals take the initiative, they do not depend on others to tell them how to approach learning, they are able to formulate their own goals and overall can be trusted with managing their time and resources as well. (Knowles, 1975; Kupa, 2020b)

Though the individuality and independency are the core attributes of SDL, both Greg (1993) and Garrison (1997) argued that SDL could also enable corporations and teams to utilise peers, members or anyone who can be considered as a learning resource to enhance the effectiveness of learning. Some prominent studies (Cicchinelli et al., 2018; Pardo et al., 2016) have also found correlations between SDL and academic outcomes of students. SDL can be used for enhancing both private and professional knowledge irrespective of institutional, geographical or situational differences (Abdullah et al., 2008), which also confirms its importance in virtual team settings. With the rapid improvement in diverse technology, online and virtual learning tools are readily available for learners. These are frequently used in virtual teams as well. (Kupa, 2020b)

When it comes to further classification of SDL, there are several approaches and divisions of domain. According to Barnard-Brak et. al. (2010) self-regulated learning skills include goal setting, time management, task strategies and environment structuring. Later this was extended with mood adjustment, self-evaluation and help-seeking by Hong et al (2021). Another classification – which will be the focus of this paper – is based on Guglielmino's (1997) Self-Directed Learning Readiness Scale, which was later adjusted and adapted by Fisher et al (2001). In Fisher's analogy, there are three main domains of SDL: self-management, self-control and desire for learning. Self-management refers to the ability of the learners to identify their needs, set their goals, and allocate their energy and time to learning. Self-control refers to the independency of the SDL learners, meaning that the learner is an independent individual, capable of analysing, planning, implementing and assessing their learning activities independently. Desire for learning refers to the strong motivation of learners to acquire knowledge (Fisher et al., 2001), (Kupa, 2020b).

3.2. SDL Measurements

There are several instruments that have been developed to measure SDL, such as the Self-Directed Learning Readiness Scale (Guglielmino, 1997), which is one of the first instruments to measure self-direction in learning and has been validated in several academic studies. One of these is the Self-Directed Learning Readiness Scale for Nursing Education (SDLRSNE) (Fisher et al., 2001), which is an adaptation of Guglielmino's SDLRS for the nursing education sector, and it has been validated in several academic studies.

Similar instruments are the Self-Directed Learning Instrument (SDLI) (Cheng et al., 2010) and the Self-Rating Scale of Self-Directed Learning (SRSSDL) (Williamson, 2007). These instruments have also been translated into various languages and adapted for different scenarios, authenticating the scientific interest for this type of measurement.

3.3. Fisher's SDLRSNE

Fisher et al. (2001) took the available literature and compiled a list of attitudes, abilities and personality characteristics of self-directed learners. The complete list consisted of 93 items among which a significant number of items were drawn from other SDLR scales such as Guglielmino's (1997), Knowles's (1975) or Candy's (1991) measurements. The Delphi

technique was used to gain consensus amongst the characteristics required for SDL through an expert panel. For an item to be retained at least 80 per cent consensus had to be achieved. (Fisher et al, 2001)

Out of the 93 items brought to the panel, 40 items remained after the principal component analysis and factor analysis. These items were divided into three subscales as follows (Fisher et al, 2001):

Self-Management:

- I manage my time well
- I am self-disciplined
- I am organized
- I set strict time frames
- I have good management skills
- I am methodical
- I am systematic in my learning
- I set specific times for my study
- I solve problems using a plan
- I prioritize my work
- I can be trusted to pursue my own learning
- I prefer to plan my own learning
- I am confident in my ability to search out information

Desire for Learning:

- I want to learn new information
- I enjoy learning new information
- I have a need to learn
- I enjoy a challenge
- I enjoy studying
- I critically evaluate new ideas
- I like to gather the facts before I make a decision
- I like to evaluate what I do
- I am open to new ideas
- I learn from my mistakes
- I need to know why
- When presented with a problem I cannot resolve, I will ask for assistance

Self-Control:

- I prefer to set my own goals
- I like to make decisions for myself
- I am responsible for my own decisions/actions
- I am in control of my life
- I have high personal standards
- I prefer to set my own learning goals
- I evaluate my own performance
- I am logical
- I am responsible
- I have high personal expectations
- I am able to focus on a problem
- I am aware of my own limitations
- I can find out information for myself
- I have high beliefs in my abilities
- I prefer to set my own criteria on which to evaluate my performance

Fisher et al. (2001) aimed that this scale be used in nursing education, to assist nurse educators in diagnosing their students' learning needs and thus implement teaching strategies that best suit the students' needs. Due to the generic wording of the questions, however, the questionnaire could be used not only for nursing educators or specifically in education, but to support virtual teams in their learning path.

Fisher and King (2010) re-visited the SDLRSNE in order to provide evidence of construct validity for the subscales. This exercise resulted in making 11 items from the list redundant, while keeping the factor structure similar. For the purposes of this study the original 40 item list was chosen and will be the base for further analysis.

The aim of the present study is to bring together the theories of virtual teams and those of self-directed learning to provide a resource which plays a significant role in the success of the team pertaining to the individuals. Through data collected among adult working population and extensive statistical analysis, our goal is to gather supportive evidence for the applicability of self-directed learning readiness beyond student populations and to confirm that the original or a modified version of the SDLRSNE scale is applicable in virtual teams. If such confirmation is not possible, then to explain the differences in terms of the context.

4. METHODS

The 40-item SDLRSNE developed by Fisher et al. (2001) was chosen to be in the focus of the study to test whether the same scale and factor structure could be applied for virtual teams. The SDLRSNE has been chosen to be the instrument tested as it had been validated several times and the wording of the 40 statements is simple enough to be understood for those who speak English as their second language. The original English questionnaire was peer-reviewed by a panel of Hungarian PhD students at the Széchenyi István University. Based on this exercise, the questionnaire was administered with the original 40 items in English for data collection purposes. Although Fisher and King (2010) reduced the 40 items to 29 in their re-evaluation study, we decided to keep all the original questions, thus providing a bigger pool of questions to be analysed and used for model development.

The aim of this research is to test the hypothesis according to which the original 40-item SDLRSNE as an instrument to test self-directed learning readiness is suitable to be applied in virtual teams with the same subscales. Should the hypothesis be rejected, we are determined to develop our own SDLR construct.

4.1. Data Collection

The data collection from the questionnaire started the end of September 2020 and continued until the end of October. Participants were asked to evaluate the items through a five-point Likert scale to the degree that individual items reflect their own characteristics. Score 1 indicated "strongly disagree", while score 5 indicated "strongly agree". Furthermore, several demographic and clarification questions were asked in order to ensure only those participant responses in the data analysis which originated from persons working in virtual teams in Hungary. Respondents could be categorised as working in virtual teams if more than 30 per cent of their time was spent working and cooperating virtually with their teammates.

Until the end of October 2020 responses had been collected, out of which 146 fulfilled all required conditions to be considered in the data analysis.

4.2. Data Analysis

Data of the final sample of 146 working adults was subjected to methods of both exploratory and confirmatory factor analysis (EFA and CFA) as well as principal component analysis (PCA). Cronbach's Alpha was calculated for the original scale confirming its usability, however, the PCA, the EFA and the CFA did not confirm the original SDLRSNE factor

structure (Fisher et al. 2001) on our sample, nor did the three one-factor congeneric model version of the SDLRSNE (Fisher and King, 2010) result in a good fit. Subsequently, we subjected our sample of adults working in virtual teams to exploratory factor analysis with the aim of establishing a new factor structure for all or at least most of the original 40 items. CFA was also reiterated after having removed items with the lowest factor loading. Due to low correlations, however, no meaningful solution was found at this level of inquiry. Finally, confirmatory factor analysis was applied aiming at maintaining the original three-dimensional factor structure but with a much-reduced item count. Content validity was sought through trying to select *best items* covering the core content of each dimension. Symmetry was considered in order to give equal weight to each subscale, and the three factors were analysed together – as opposed to the congeneric models (Fisher and King, 2010) – in order to legitimise the three subscales belonging together in one questionnaire despite the relatively low correlation among the dimensions. The data analysis process carried out in this paper, in practical terms, could be interpreted as the creation of a short form of the original SDLRSNE, because the reduced scale captures most of the original construct in terms of context. On the other hand, if we consider the context of virtual teams, the developed SDLR9 scale can be regarded as a new construct. All analyses were carried out with the statistical software R studio (RStudio Team, 2020).

5. RESULTS

Given our data with adult working population from a cross-section of virtual teams we first aimed at testing the known SDLRSNE models in the literature. We approached the process of factor analysis as an experiment to confirm the established self-directed learning readiness theory but knowing that several modified scale versions had been already published and perhaps our analysis would lead to a new one. We first resorted to confirmatory factor analysis to test the 3 factor 40 item SDLRSNE developed by Fisher et al. (2001) and the 29 item three one factor congeneric model used some 10 years later by Fisher and King (2010) to confirm the basic factor structure of the self-directed learning readiness construct. Results on our data set of adult population working in virtual teams were insufficiently good to confirm these models. CFA results for the 3 factor 40 item SDLRSNE showed a bad model fit (CFI = .552, RMSEA = .089, SRMR = .101). Alpha values for the three factors were .81, .76 and .78 respectively. CFA for the three one factor congeneric model showed poor fit for the first two factors while bad model fit for the third factor bringing us, overall, to reject the model for virtual teams. (Factor 1: CFI = .809, RMSEA = .097, SRMR = .072; Factor 2: CFI = .842, RMSEA = .09, SRMR = .073; Factor 3: CFI = .589, RMSEA = .113, SRMR = .09). CFA results are summarized in Table 1.

Table 1. Confirmatory Factor Analysis of Self-directed Learning Models

Models	**X2**	**df**	***p***	***CFI***	***TLI***	***RMSEA***	***SRMR***
40 item SDLRSNE 3-factor	2666	780	.000	.552	.525	.089	.101
Three one factor congeneric							
Factor 1	544	78	.000	.809	.771	.097	.072
Factor 2	386	55	.000	.842	.803	.090	.073
Factor 3	593	120	.000	.589	.526	.113	.09
SDLR9 second order factor model	352.28	36	.000	.097	.096	.049	.049

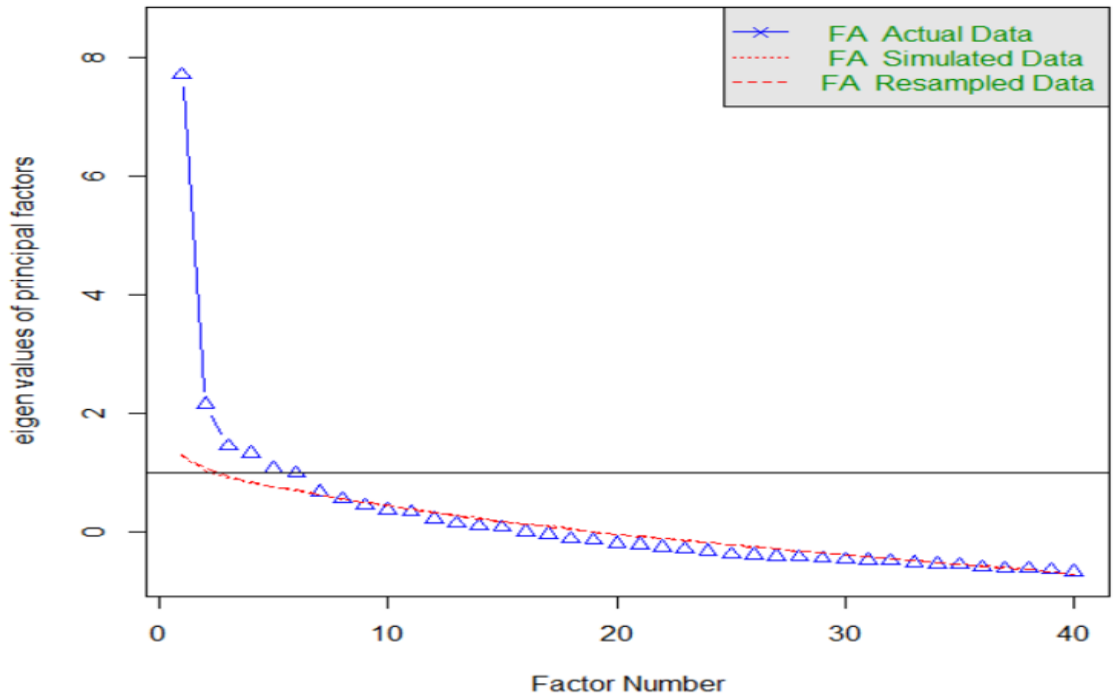
Source: Own evaluation

Since the 3 factor 40 item SDLRSNE was originally arrived at through principal component analysis (Fisher et al., 2001), we computed a similar analysis on our sample with varimax rotation for 3 factors, however, the total variance explained by the model was only 30 per cent.

We intended to map the construct's factor structure further with exploratory methods, thus we resorted to exploratory factor analysis. We first computed a Bartlett's test to make sure if items are correlated enough for an EFA (X2 = 2389, p = .000). We then computed a Kaiser-Meyer-Olkin (KMO) Test for Sampling Adequacy to make sure that our dataset has a sufficient number of subjects (Overall MSA = .78). Subsequently, we computed the EFA for the 3-factor model using oblique rotation (since factors within the same scale are expected to correlate) and using the maximum likelihood factor math. Fit indices overall were insufficient to confirm the model (CFI = .703, RMSEA = .08) and the model overall accounted only for 30 per cent of the variance of the items, just like in the case of principal component analysis.

Because the 3-factor models know from the literature failed on our sample, we set out to estimate anew the number of factors for the EFA. In order to determine the number of factors we used the Kaiser criterion with eigenvalues above .7 as per the newer approach and eigenvalues above 1 as per the traditional approach. The number of factors suggested by the Kaiser criterion to set for the EFA was 6 and 5, respectively. We also computed a parallel analysis which compares data to randomised iterations in order to be able to select all factor with eigenvalues significantly above the randomised data. For this we used a scree plot (Figure 1) to determine the point of inflection.

Figure 1. Parallel analysis scree plot for EFA



Source: own evaluation

Results of the parallel analysis suggested we use 7 factors. Keeping in mind that parsimony dictates that simpler models with fewer factors are preferable over more complex ones we computed EFA for all suggested factors with the results shown in Table 2. Since none of our new EFA models with all 40 items manifested a good model fit and explained sufficient cumulative variance, we tried to eliminate items with factor loadings lower than .3. After several iterations we abandoned the exploratory method and tried to do the same item selection based on factor loading results with confirmatory factor analysis for the 3-factor model. Fisher and King (2010) used a similar approach to arrive to the congeneric one factor models, the difference being that, as per our logic, we aimed at keeping the factor structure intact if we must

eliminate items. The self-directed learning model was not possible to confirm with this approach either.

Table 2. Exploratory Factor Analysis of Self-directed Learning Models

EFA Models	Cumulative Variance	CFI	TLI	RMSEA
3 Factor model	.3	.703	.643	.08
5 Factor model	.37	.826	.761	.068
6 Factor model	.41	.87	.809	.063
7 Factor model	.43	.898	.839	.059

Source: Own evaluation

Finally, we changed our experimental approach from trying to keep most of the original items to using only as many items as necessary and possibly keeping the original three factor model. Looking at the correlation table we identified possible items and considering the broadest possible content we determined best items for our subsequent confirmatory factor analysis. Knowing that three items per factor are minimum necessary, and keeping in mind model aesthetics, we aimed at a 9 item 3 factor model with three items loading on each factor. We also experimented with second order models driven by the idea that perhaps self-directed learning readiness is a separate latent variable in individuals that explains their levels of the first order latent factors. The model that we found, so to say, mirrors the traditional factor structure with three correlated factors. But more than this, for the first time, self-directed learning readiness is shown to be a higher order latent construct that explains the first order factors. We think that our new model is significant because it confirms the legitimacy of the self-directed learning readiness measure for virtual teams of working adult population, while at the same time it represents evidence for the higher order self-directed learning readiness factor.

6. DISCUSSION

As per the standard of several published studies (Newman, 2004; Bridges et al., 2007; Smedley, 2007), internal consistency is a decisive factor when evaluating the SDLRSNE. Based on the results, the Cronbach's Alpha scores support the applicability of the original 40 item SDLRSNE questionnaire in its original form on our sample of Hungarian adults working in virtual teams. On the other hand, deeper analysis about the factor structure of the construct revealed the insufficiency of the original 40-item scale (Fisher et al, 2001) on our sample, as several attempted methods of analysis (CFA, PCA with varimax rotation and EFA with oblique rotation) resulted in not supporting the applicability of the original SDLRSNE questionnaire for virtual teams. The revised scale of Fisher and King (2010) with 3 congeneric factors was also not possible to confirm on our sample. Thus, our hypothesis that the same 40-item SDLRSNE could be applied for virtual teams has to be questioned.

On the other hand, we did not only aim at confirming the SDLRSNE's applicability, but we were inspired by Fisher and King to revise and change the SDLRSNE scale and test whether by using different techniques and approaches we could find the best scale for the SDLR construct for virtual teams – more specifically for the working adult population of our sample. First, we tried to keep all items and recalibrate the factor structure, but EFA results failed to point to any alternative factor structure. We then tried to maintain the factor structure but eliminate weaker items. Larger models with many items did not fit as per our EFA and CFA results. The statistical reason behind these failed models is that there is low correlation between items in general on our sample. Finally, we found satisfactory models with low item numbers, thus we propose for adult working population in virtual teams the newly developed SDLR9 scale. The factor structure and the 9 items of the SDLR9 scale is the following (Table 3):

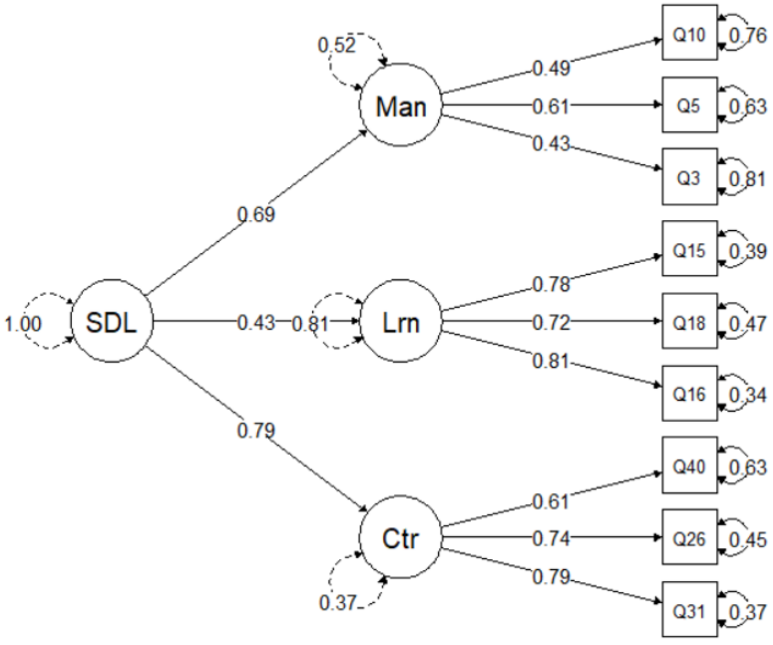
Table 3: Factor structure of the SDLR9

Self-Management	Desire for Learning	Self-Control
I am organized I have good management skills I prioritize my work	I enjoy learning new information I have a need to learn I enjoy studying	I prefer to set my own goals I prefer to set my own learning goals I prefer to set my own criteria on which to evaluate my performance

Source: Own evaluation.

When this reduced item scale had been discovered during the analysis as a potential fit for the virtual teams, first the applicability of the items had to be analysed. Interestingly, when comparing the SDLR9 and the 40-item SDLRSNE, it seems that the SDLR9 managed not only to reduce the number of questions while keeping the same factor-structure but was able to mirror much of the essence of these subscales intact even after radically reduced item number. As noted in the theoretical analysis, self-management refers to the ability of learners to identify their needs, set their goals and allocate their time and energy to learning. The three items in this sub-scale reflect these requirements, as they cover management, prioritisation and organisation skills of the individuals. Desire for learning focused on the strong motivation and preferences of learners to acquire knowledge – the reduced subscale in SDLR9 also focuses on the need and motivation for learning. When it comes to self-control, the original items were revolving around the independency of the individual in their learning path which can also be seen in the 3-item subscale, as the wording emphasises the preference for individuality in their learning and goals.

Figure 2. The higher order construct resulting from the SDLR9 scale



Source: Own evaluation

The SDLR9 also has excellent psychometric properties as a unified model confirmed by CFA in contrast to the larger models proposed in the literature. Moreover, for the first time we are able to propose the SDLR construct as a higher order latent variable with the three original first order factors (Figure 2). A significant theoretical implications of the self-directed learning readiness construct as a higher order variable is that SLDR was never before conceived as a

unified personal resource that would work beyond the original first order factors of self-management, desire for learning and self-control. The low correlations that we observed when considering all items explains not just why the larger models did not work specifically on our sample, but probably also why previous investigations found it hard to fit all three factors in one factor analysis (Fisher and King, 2010). By radically reducing the item number and taking advantage of the more correlated items one could argue that we arrived at a fundamentally different construct from the original SDLR as applied for nursing education. We would not necessarily contradict this observation primarily because the context of our research is outside of nursing and also education. For working adults specifically from the world of virtual teams SDLR may mean somewhat different things, but whatever they are, they are important for the management literature. Thus, we are confident to propose the self-directed learning readiness construct for virtual teams and the related SDLR9 scale not necessarily as a shorter version of the 40 item SDLRNE, but as an individual instrument. Content analysis of the SDLR9, we believe, would show that the essence of the original SDLRNE is captured rather well, therefore given certain considerations such as time constraint or repetitive measurement, the SDLR9 could also be conceived of as a short form of the SDLRNE. The higher order factor structure evidenced in our model is an interesting development that would require follow up investigation on other samples, but it has the potential to elevate the research in self-directed learning readiness to a next level.

7. CONCLUSIONS

Virtual teams require different skills and capabilities from their leaders and members. This research aimed at looking at the level of the individual and analyse whether self-directed learning readiness scales could be applied in virtual team settings. We collected a sample of 200 working adults from virtual teams in Hungary to test our hypothesis whether the SDLRSNE scale of Fisher et al. (2001), previously tested only in nursing education, could be adapted without changes to our sample. Based on the results of the statistical analysis, this hypothesis had to be rejected, which could be explained by applying the scale to a different type of learners (working adults, who are learning on the job), on a different social group (working adults) and from a different country (Hungary).

Although our statistical analysis did not allow us to confirm our original hypothesis, the research resulted in a new SDLR9 scale. This model follows the same 3-factor structure as the original 40-item SDLRSNE, the reduced number of items is still sufficient to reflect the requirements set forth in the academic literature for self-management, desire for learning and self-control. At the same time, as a novelty, it proposes self-directed learning readiness as a higher order latent variable, which was not present in the previous models.

There are, inevitably, limitations to this theoretical model which should be further tested to prove its suitability for virtual teams. The next step should be to validate the model, collect data from working adults in virtual teams and perform the same confirmatory factor analysis and statistical methods. If the model could be validated, this could provide a great tool for the leaders of virtual teams in the selection, learning and development process.

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