https://doi.org/10.53656/nat2023-3-4.02

Science and Society

AGILE SOFTWARE DEVELOPMENT ASSISTED IMPLEMENTATION OF A MENTORING SOLUTION IN A LARGE ENTERPRISE

Vladislav Yurukov
Department of Cultural Studies,
South-West University "Neofit Rilski" (Bulgaria)

Abstract. Mentoring and coaching have many forms and formats. Choosing the right one is often challenging because of cost, delays on program launch, concerns with adoption, participation and capacity, overall readiness of mentors, prioritization and how it fits the company's objectives and culture. As part of talent development, organizational solutions, productivity and automations teams, which aim to develop mentor-mentee (coach-coached) matching engine and overall business process automation of a mentorship program, we had to identify the key deliverables, main features, evaluate existing solutions and then design, develop and operate the system. In this paper we present the in-house development process of a mentoring program software solution, its architecture and operations in trivago from 2018 until 2020.

Keywords: mentoring; coaching; leadership; talent development; software engineering; agile methodology

Introduction

Mentoring has been recognized and implemented by 70% of Fortune 500 companies as a powerful way to attract, develop and retain their talents. Successful mentoring has strong professional and personal benefits for mentors, mentees and organizations: rapid career advancement, higher salaries, better career satisfaction, improved health, psychological well-being, happiness and better work-life balance are some. Study implies happiness at work is responsible for better productivity. A failing mentoring program results to organizational waste, personal disappointment and overall has a negative impact than no mentoring at all.

Various formats of learning and talent development (L&TD) programs are recognized in the existing literature. Within the realm of higher education mentoring is identified as development tool for both students and faculty (Knippelmeyer et al. 2007; Amaury & Crisp 2007). Afandi (2021) has compared effectiveness of mentoring (as knowledge transfer mechanism) and coaching (empowers the potential of employee) in the context of a construction company. The L&TD program focus often shifts between:

- accelerate learning and development,
- develop leadership potential,
- support diverse and underrepresented talent like women underrepresentation in STEM disciplines (Hernandez et al. 2017)
- empower new hires to succeed.

Based on the approach to talent pool programs can be inclusive for all employees or exclusive – available for a group of managers or selected few (Maycock & Ikuomola 2015).

Within workplace environments there are:

- On-the-job learnings that include apprenticeship and internship, delegation, shadowing and peering, project rotation and temporary promotion.
- Group learnings in conference style like trivago Tech Get Together (a 2 days trivago internal technology conference), networking events, group meetups, leadership retreats, discussion boards where employees can exchange ideas and practices, present successes and failures.
- Individual learnings include Coaching, Executive coaching, E-Learning, Mentoring, Distance learning, Buddy program, self-study and reflective practice (Maycock & Ikuomola 2015).

International Coaching Federation (ICF) defines coaching as partnering with clients in a thought-provoking and creative process that inspires them to maximize their personal and professional potential. The process of coaching often unlocks previously untapped sources of imagination, productivity and leadership.

Anna Britnor Guest defines mentoring as transfer of wisdom process by which an individual learns from someone who has worn the same shoes and travelled the same path (1999).

The boundaries between terms coaching and mentoring are now dissolving as mentors discover that mentoring in a coaching style is more effective than simply giving advice, while it is becoming increasingly acceptable for coaches to give advice and share their experience.

A mentoring program can be formal, promoted and sponsored by leadership and supported with people and resources like admin team driving adoption, training, matching, resolving conflicts etc. or it can be informal and let grow organically by encouraging talents to connect and form the relationships themselves.

To avoid the common mentoring pitfalls identified by Penton and Welsh (2004) and to deliver a successful mentoring program in a cost-efficient way we decided to first go through "buy or build" assessment of the existing software, then to follow the agile methodology and address the problem area as product development in repetitive cycles to address and adapt to fast changing requirements, volatility, uncertainty, complexity and ambiguity.

Methods

The present research has been completed using the qualitative research methods so that in-dept insights are captured. The conducted qualitative research methods (one-to-one interviews, focus groups, ethnographic research, record keeping) have been selected to study and analyze the needs, expectations and software features of a mentoring program in the Trivago company.

The cross-functional team has been following agile methodology already with proven track of successful projects – 12 for the previous year.

To avoid ambiguity and foster better communication, we decided to assign formal meanings of the main terms in the domain area. This terminology alignment has been conducted as focus group ideation process.

Talent – each employee is seen as a talent to be developed in order to reach their full potential.

Talent Lead – often interchangeable with Mentor, a role of colleague with advanced experience or knowledge committed to provide career support and personal development. The role is assigned after one-to-one interview with the candidate assuring their motivation and capability helping others.

Obi Wan – a talent lead of talent leads. Also appointed after interview, Obi Wan is a go-to person when a talent lead needs support with a complex case.

Capacity – how many talents a talent lead can lead simultaneously. The free capacity is the sum of the free spots available.

Preference – an explicit talent desire to be matched with a specified colleague.

Attribute – character trait offered by talent lead and used in the matching process.

Match – the evaluation of a potential relationship between talent and talent lead. If it is nominated as Best match can transform to talent – talent lead Relationship.

Best Match – the match with highest score for the talent.

Matching – the process of evaluation the potential matches for all talents without a talent lead.

Relationship – current or past relationship between talent and talent lead.

Conflict of interest – a person not to be matched with. Includes teammates, teammates' talent leads, anyone in employee's management chain (reporting to or being responsible for), key stakeholders, close friends or family members.

Scope, deliverables and requirements

The leadership vision was to implement a new leadership model that includes Manager (responsibility lead), Mentor (talent lead) and Subject Matter Expert (knowledge lead) all of them focused and working together on different aspects of talent's development.

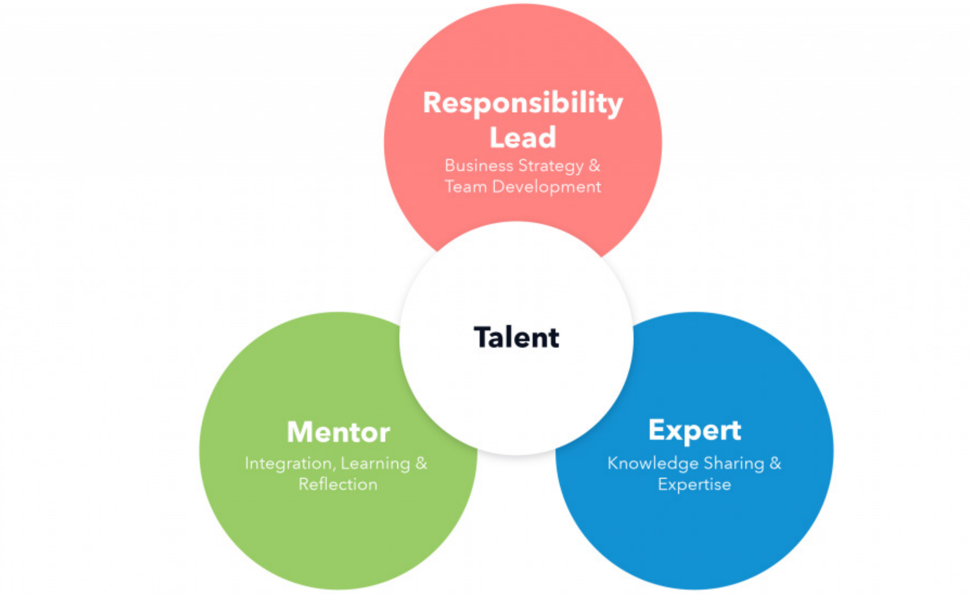

Responsibility Lead
Business Strategy & Team Development
Talent
Mentor
Integration, Learning & Reflection
Expert
Knowledge Sharing & Expertise

Figure 1. The three pillars of desired leadership model.

The scope of our project was defined as implementing a formal program, sponsored by leadership, inclusive for everyone in the company and focused on building, facilitating and maintaining Talent – Mentor relationships.

Expected deliverables were:

- Adoption campaign to articulate the benefits of the program for everyone (talent, leadership, shareholders, customers).
- Flowless registration process including registration forms for talents, talent leads and Obi Wans, personalized notifications in Outlook and Slack and data integrations with Human Resource system (Workday).
- Matching algorithm based on 10+ datapoints, that is fair, time sensitive and cost effective to run twice per year as major matching and multiple times as ad-hoc matching (for new joiners or talents that had their talent lead on leave).
- User experience that is coherent with the overall trivago employee user experience: the forms and views must follow trivago's visual doctrine, logo, colors, fonts, visual components (date picker, people picker etc.) from trivago frontend library.
- GDPR and SOC 2 ready record processing and keeping.

Requirements were collected in interviews, focus groups, ideation meetings and were organized as processes and user stories.

The user stories were classified by role and priority (P1 being the highest priority and P4 being the lowest priority):

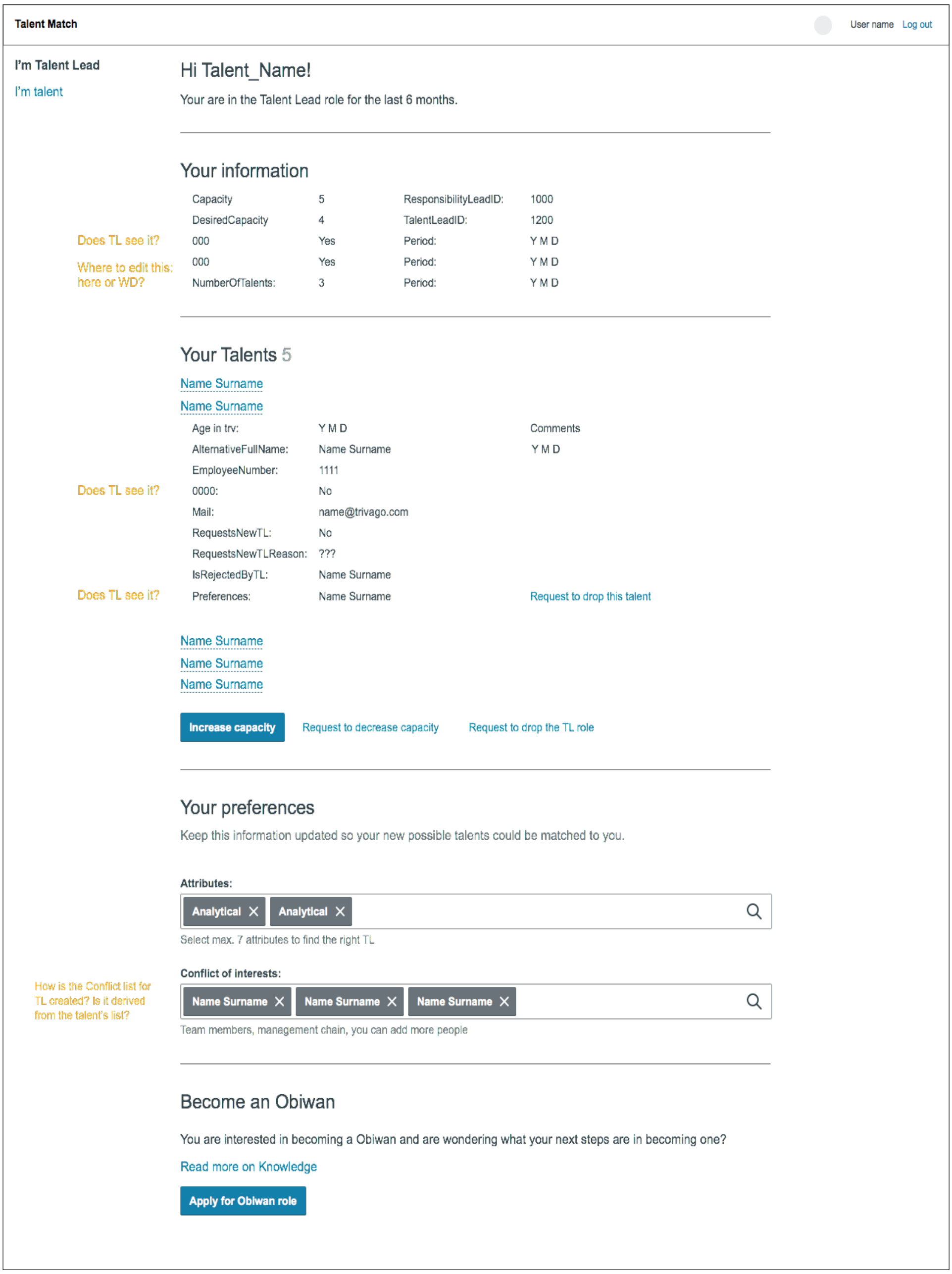
Table 1. User stories classification and prioritization

Role	Sum of P1	Sum of P2	Sum of P3	Sum of P4
Talent	5	2	2	1
Talent lead	3	2	0	4
Admin	2	3	0	3
Automation	5	0	1	1

Additional requirements were added for better cohesion and maintainability within trivago internal tools landscape:

- Using **Single sign-on (SSO)**. With SSO, users can access all needed applications without being required to authenticate using different credentials.
- **Logging and exception handling** to be consistent with the rest of the internal tools for coherent troubleshooting experience.
- **Monitoring** to be integrated with our agile project management and support tickets and incident management tools.
- **Reporting and analytics** dashboards.

Visual concept and mockups were created with a UI/UX designer setting the expectations for user experience and esthetics.



Talent Match

User name Log out

I'm Talent Lead

I'm talent

Hi Talent_Name!

Your are in the Talent Lead role for the last 6 months.

Your information

	Capacity	5	ResponsibilityLeadID:	1000
	DesiredCapacity	4	TalentLeadID:	1200
Does TL see it?	000	Yes	Period:	Y M D
Where to edit this: here or WD?	000	Yes	Period:	Y M D
	NumberOfTalents:	3	Period:	Y M D

Your Talents 5

Name Surname

Name Surname

	Age in trv:	Y M D	Comments
	AlternativeFullName:	Name Surname	Y M D
	EmployeeNumber:	1111	
Does TL see it?	0000:	No	
	Mail:	name@trivago.com	
	RequestsNewTL:	No	
	RequestsNewTLReason:	???	
	IsRejectedByTL:	Name Surname	
Does TL see it?	Preferences:	Name Surname	Request to drop this talent

Name Surname

Name Surname

Name Surname

Increase capacity   Request to decrease capacity   Request to drop the TL role

Your preferences

Keep this information updated so your new possible talents could be matched to you.

Attributes:

Analytical ✕ Analytical ✕

Select max. 7 attributes to find the right TL

Conflict of interests:

Name Surname ✕ Name Surname ✕ Name Surname ✕

Team members, management chain, you can add more people

How is the Conflict list for TL created? Is it derived from the talent's list?

Become an Obiwan

You are interested in becoming a Obiwan and are wondering what your next steps are in becoming one?

Read more on Knowledge

Apply for Obiwan role

Figure 2. Visual concept requirements

Overall process timeline during major allocation was seen as:

- – Talent leads' registration and interviews – 3 weeks
- – Talents' registration – 3 weeks
- – Admin assisted talent matching process – 1 week
- – Additional communication and consents for the formed relationships – 1 week

Buy or build evaluation

To evaluate whether we should buy an existing tool or start an in-house product development we had to estimate the time, effort and budget to build for which we've used Cost of Delay methodology (Arnold & Yüce 2013). Then we've compared the in-house approach with several existing tools by following criterions:

- – Functional requirements (must have – P1 and P2)
- – Architectural requirements
- – Cost effectiveness

Table 2. In-house and external tools comparison score table

System	Functional score	Architectural score	1st year costs	2nd year costs
In-house development	100%	100%	€ 16220	€ 1920
Mentorloop	65%	45%	€ 24400	€ 24400
Together Mentorship	55%	55%	From € 13711	From € 13711
MentorcliQ	80%	70%	€ 18282	€ 18282

Main obstacles with external tools for mentoring program were:

- – Design, UI/UX expectations not met.
- – Features missing (Obi Wan, role changes, automated notifications via desired communication channels).
- – Integration gaps between the external systems and trivago internal tools, practices and landscape (Slack, Workday, JIRA). Reflected in Architectural score column.
- – Undesired features that couldn't be disabled and will steer the users in different direction.
- – Cost of implementation. Additional costs of adoption, transition and decommission were not calculated.

In-house product development estimates showed the minimal viable product (MVP) can be completed in 572 manhours spread in 4 weekly cycles (sprints).

Table 3. Implementation estimates

Function	Estimated manhours
Development	376
Initial planning	8
Planning	16
Planning and architecture	92
Setup CI/CD	16
Testing	64
Grand Total	**572**

Cost of delay analysis showed an opportunity window of just one month for implementation before the next major matching planned for October 2018. Cost efficiency factors only were considered for the analysis:

– Cost efficiency from automation and productivity throughout the year $ 400/week

– Cost efficiency from automation and productivity during the major matching months – two months, twice a year were estimated as $ 1000/week.

Protected revenue and sustaining market share because of the company culture and new leadership model was impossible to evaluate. Later a correlation was noted between the new leadership model implementation and share price increase from $ 4.77 (12.10.2018) to $ 7.44 (02.11.2018) but since no solid evidence was found for causality, it was not used in the cost of delay analysis.

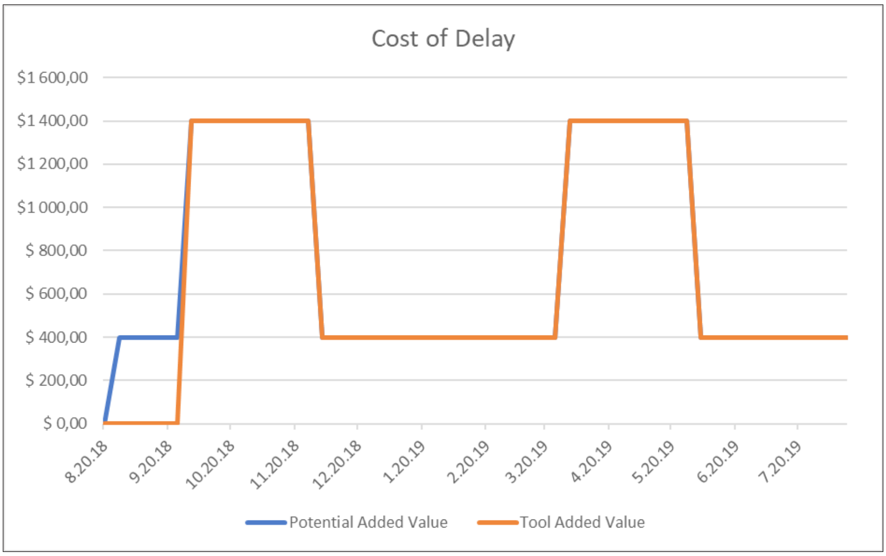


Figure 3. Cost of Delay is $400/week for one month 20.08.2018 – 20.09.2018

Results and discussion

In agile development methodology a high-quality software was developed by high-performing, cross-functional team in weekly increments. The principles of continuous and incremental improvements, testing based on fast feedback, and responding to changing requirements were adopted upfront. Stoica et al. (2013) highlight some of the advantages of agile methodology:

– each stage delivers a working product, that meets some of the client requirements.
– client feedback is distributed throughout the entire development process.
– it is more flexible than waterfall – involves lower costs when purpose and requirements change.
– it is easy to test and debug during a small iteration.
– the risk is easier to manage because all risks are identified and managed during
the iteration.

The solution architecture elements were a MSSQL Database hosted on Azure Cloud. Web application accommodating talent, talent lead, admin views and general dashboard and hosted on Azure Cloud. Long-running jobs responsible for automations, reporting, integrations and matching algorithm and hosted on-premises.

On the first iteration we've implemented the overall project structure, exception handling, logging, authentication and the must-have features (Priority 1 and 2) of talent lead registration form. Iteration was completed with an internal demo and feedback discussion. Unit and automation testing was implemented as part of CI/CD.

On the second iteration we've implemented with priority a bugfix and feedback from previous iteration, then the must-have features (Priority 1 and 2) of talent registration form. The iteration was completed with a demo and feedback. The unit and automation testing coverages were extended further. At that stage the team was already confident in the success of the project.

On the third iteration we've implemented the admin functions like triggering major or mini matching, opening and closing registration forms, a comprehensive usage and capacity dashboard, personalized notifications engine and the matching algorithm. An extensive quality assurance and user acceptance testing was performed end to end.

On this iteration we've refactored the algorithm in order to handle corner cases that we haven't thought of initially like talent leads changing teams, prioritizing between talents with similar interests, management level and start date etc.

On the fifth iteration we were already in software maintenance mode – not actively developing new features but scouting for issues and bugs and improving maintainability, performance and stabilizing the application. Performance and load testing analysis were conducted using JMeter tool (Kiran et al. 2015). Weak points of heavy load were identified and fixed. Some "nice-to-have" features (Priority 3 and 4) were implemented and others were canceled as not worth the investment.

After the mentoring solution went live no major issues were reported and there was an overall excitement in mentoring program participants to use and adopt the new tool. Their learning curve with the tool was relatively low because of the familiar UI/UX components, SSO, personalized views and notifications guiding them throw-out the program.

After a year in the program and several major matching campaigns the following emerging patterns were identified and some of them addressed with development:

- Most of relationships where talents applied for a specific talent lead didn't last longer than the most of relationships based on attribute matching.
- Relationships based on attribute matching with 3 or more matching attributes (out of 5) were lasting longer and had a higher satisfaction score.
- Same location relationships showed higher satisfaction score.
- The concept of high and low maintenance talents formed around the observation of some talents asking for longer and more frequent sessions, changing several talent leads and reporting low satisfaction score from multiple relationships.
- Because of data sensitivity limitations no correlation was investigated between the mentoring program data and performance reviews, pay rates, gender etc.
- Talend lead's capacity was a precious and limited commodity worth competing for. Prioritizing talents with higher management level had a faster ROI because they had a larger impact and more opportunities to practice. They often developed desire for talent lead role.
- Effective talent lead capacity was between 2 and 4 talents, enough to provide various contexts but not too many to impact with the everyday duties and responsibilities of the talent lead. A "professional" talent lead role was not supported.
- New talent leads motivation and capability screening was improved.
- There were relationships deviating far from the predefined scope. They were addressed with regular informational campaigns on program goals, talent lead role and overall guidance.
- Aligning the terminology upfront facilitated the effective communication in all phases of the project.

Conclusions

This article presents an empirical study of the capabilities of agile software development to practically reveal the mentoring program implementation challenges, to minimize risk, to reduce cost and to learn and respond of fast changing requirements in iterative manner. The following qualitative research methods were used for requirements gathering and interpretation: one-to-one interviews, focus groups, ethnographic research, record keeping.

An actual in-house product is implemented, adopted and operated for extended period by 1000+ users. Patterns are identified and observations are captured.

As a result of the study, we can conclude that agile software development methodology can be used as main approach for researching a problem area, minimizing risks, reducing costs and assisting a talent development leadership in mentoring program implementation.

Acknowledgements

We express our gratitude to trivago leadership team and especially Rolf Schrömgens for supporting and sponsoring the program, to John Bettiol and Sophia Georgiou for setting the foundation, to the leadership development experts Heather Lowman and Joanna Krueger for all the meetings, interviews, tests, feedback and late-night talent matches. Special thanks to the agile dev team members Matthias Ramge, Nick Mattiello, Sebastian Gregorius, Marvin Friedrich, Shay Zadegan and Velizar Kostadinov.

REFERENCES

AFANDI, A, 2021. Mentoring program: Empowerment and Human Resources Development. *Akademik: Jurnal Mahasiswa Humanis.* vol. 1, no., pp. 87 – 94. https://doi.org/10.37481/jmh.v1i3.458.

ARNOLD, J. J., YÜCE, Ö., 2013. Black Swan Farming Using Cost of Delay: Discover, Nurture and Speed Up Delivery of Value. Agile Conference. Nashville, TN, USA. pp. 8 – 13. https://doi.org/10.1109/AGILE.2013.16

AMAURY, N., CRISP, G., 2007. Mentoring Students: Conceptualizing and Validating the Multi-Dimensions of a Support System. *Sage Journals*. vol. 9, no. 3, pp. 337 – 356. https://doi.org/10.2190/CS.9.3.e.

CANTALUPO, G., 2022. Does Mentoring Still Matter for Fortune 500 Companies? *Forbes*.

HERNANDEZ, P.R., BLOODHART, B., ET. AL., 2017. Promoting professional identity, motivation, and persistence: Benefits of an informal mentoring program for female undergraduate students. *Plosone.* https://doi.org/10.1371/journal.pone.0187531.

JOHNSON, W.B., SMITH, D.G., HAYTHORNTHWAITE, J., 2020. Why Your Mentorship Program Isn't Working, *Harvard Business Review*.

KIRAN, S., MOHAPATRA, A., SWAMY, R., 2015. Experiences in performance testing of web applications with Unified Authentication platform using Jmeter. *International Symposium on Technology Management and Emerging Technologies (ISTMET).* Langkawi, Malaysia. pp. 74 – 78. https://doi.org/10.1109/ISTMET.2015.7359004

KNIPPELMEYER, S. A., TORRACO, R. J., 2007. Mentoring as a Developmental Tool for Higher Education. *Academy of Human Resource Development International Research Conference in The Americas*, Indianapolis, USA.

MAYCOCK, E. & IKUOMOLA, O. A., 2015. Learning and talent development: a review in context. *International Journal of Advanced Research in Engineering & Management (IJAREM).* vol. 1, no. 2, pp. 98 – 111.

OSWALD, A. J., PROTO, E., SGROI, D., 2015. Happiness and Productivity. *Journal of Labor Economics.* vol. 33, no. 4, pp. 789 – 822. https://doi.org/10.1086/681096.

WELSH, S., 2004. *Mentoring The Future: A Guide to Building Mentoring Programs That Work.* ↱ Global Book Publisher Canada ISBN: 1-55430-011-8.

RAGINS, B. R., COTTON, J.L., MILLER, J. S., 2017. Marginal Mentoring: The Effects Of Type Of Mentor, Quality Of Relationship, And Program Design On Work And Career Attitudes. *The Academy of Management Journal.* vol. 43, no. 6, pp. 1177 – 1194, https://doi.org/10.5465/1556344

STOICA, M., MIRCEA, M., GHILIC-MICU, B., 2013. Software Development: Agile vs. Traditional. *Informatica Economică.* vol. 17, no. 4, pp. 64 – 76. http://dx.doi.org/10.12948/issn14531305/17.4.2013.06.

✉ **Vladislav Yurukov**
ORCID iD: 0009-0004-3840-3320
Department of Cultural Studies
South-West University "Neofit Rilski"
66, Ivan Mihailov St.
2700 Blagoevgrad, Bulgaria
E-mail: vyurukov@pliak.com