EXPLAINING THE INTENTION OF SOFTWARE DEVELOPERS TO PERFORM ENTREPRENEURIAL COMPETENCIES

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Abstract: Recent studies have been promoting entrepreneurial competencies for software developers. However, software developers must have the intention to perform entrepreneurial competencies effectively. Therefore, this study aims to investigate behavioural intention of software developers by extending the Theory of Planned Behaviour with self-efficacy and entrepreneurial competencies and indirect relationships via antecedents of behavioural intention. This study adopted a purposive sampling technique and validated 268 questionnaires for statistical analysis. A Partial Learning Algorithm was used for data analysis. The Perceived Behavioural Control has demonstrated extreme impact on the intention of software developers to perform entrepreneurial competencies when developing a software product, while the subjective norm has shown a negative impact on the software developers' intention. The study presents empirical evidence meant for the applicability of the extended Theory of Planned Behaviour to perform entrepreneurial competencies effectively. The findings contribute valuable insights to the growing interest of researchers to explain software developer's intention to perform entrepreneurial competencies.

Keywords: entrepreneurial competencies, intention, software developer, Theory of Planned Behaviour

JEL: O.

Introduction

A nation's economy success is considered as the positive outcome of any entrepreneurial effort. As indicated in a study by Schelfhout et al., (2016),

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entrepreneurship contributes to the development of a sustainable economy. However, the levels of entrepreneurship and the creation of new businesses vary among nations. According to the survey data published by Global Entrepreneurship Monitor in 2018, the Malaysian entrepreneurial spirit index rate was -0.03, which is lower compared to other neighbouring countries, namely Indonesia and Thailand (GEM, 2018). The entrepreneurial spirit was evaluated based on three dimensions, namely entrepreneurial awareness, entrepreneurial self-efficacy and opportunity perception. According to the statistics, Malaysia performed lower in perceiving opportunities and perceiving capability than these countries. The index is rather threatening and can significantly affect the economy of the country. Entrepreneurial awareness refers to the entrepreneurial concepts and the practice of entrepreneurial competencies (EC) by an individual (Syden & Shaw, 2014). Although an individual has knowledge of the EC, however, they are influenced by some factors when performing the entrepreneurial competencies. The lack of EC has a substantial impact on a country's entrepreneurship development (Charles, 2015). The application of entrepreneurial knowledge and competencies tremendously boost the individual intention to explore new and diverse opportunities thus enhancing their entrepreneurial spirit (Schelfhout et al., 2016). This is a broad idea that can be connected to a multitude of EC (Gibb, 2002) including strategic thinking, relationship, conceptual thinking commitment, personal maturity, and organising (Man, 2001; Mitchelmore & Rowley, 2010). Previous studies have not explored the factors influencing the intention of individuals in performing entrepreneurial competencies. Understanding the intention is crucial as each person behaves in accordance with their intentions (Ajzen, 1991).

The majority of studies have been dedicated to the significance of entrepreneurial competencies and heavily concentrated on the field of business and management (Khalid & Bhatti, 2015; Mitchelmore & Rowley, 2010; Sánchez, 2012; Schelfhout et al., 2016), and less attention has been devoted to the software development field. Today, software firms are becoming one of the major forces behind the economy and innovation. The knowledge, skills, and abilities of the software developers determine the quality of the software products as well as the level of innovation they showcase (Colomo-Palacios et al., 2013; Sudirman et al., 2020). In this sense, recent studies have emphasized that the use of EC is equally important as technical skills when developing a software (Aisha et al., 2016; Martens et al., 2015; Tolfo et al., 2018). Likewise, recent researchers have validated the practice of EC in the Agile software development (Tolfo et al.,

2018) and in the Lean principle (Edison et al., 2018) to enhance the software project success. However, failure to recognise the factors influencing the intention to perform EC may bring in more conflicting outcomes and make the practice of EC inefficient. This is validated by a study that the entrepreneurial activities are performed based on individual intention (Krueger JR et al., 2000). According to Ajzen (1991), an individual's activity is strongly determined by their intention to perform an action. Software developers may have knowledge of EC, but certain circumstances or factors might impact on how the EC is performed. Therefore, this study is designed to investigate the intentional factors that influence software developers to perform EC when developing a software project.

Theoretical Development

Researchers from various disciplines generally agree that the best predictor of any kind of planned behaviour is intent (Ajzen, 1991; Norman & Hoyle, 2004; Yaghoubi Farani et al., 2017). The Theory of Planned Behaviour (TPB) is a well-established model for investigating individual intention to perform a behaviour. This study uses TPB as a central theoretical model. The TPB's key determinant is intention, which is considered to be well predicted by three motivating components, namely attitude to perform an action, subjective norms and perceived behavioural control (PBC). However, several limitations were discovered in previous research. Firstly, most studies focused on investigating entrepreneurial intention of individuals to begin a new venture (Koe et al., 2012; Nieuwenhuizen & Swanepoel, 2015), but none of these studies explored software developer's intention to perform EC effectively. Secondly, there are also more elements, besides these motivating components, which influence significantly the determining intentions but are not included in the TPB. Ajzen (1991) has claimed that the TPB is adaptable to the introduction of new predictors as long as there is a solid theoretical basis for doing so and they account for a substantial fraction of the distinctive individuals' intention or action after the standard variables of the theory have been taken into account. Due to these limitations, it is still vague on factors influencing the intention. Thirdly, most crucially, TPB has not been thoroughly applied in a software development context to investigate the software developers' intention to perform EC. In this study, self-efficacy and EC were added to the TPB model based on the TPB's fundamental elements.

TPB elements are claimed to capture "how hard people are willing to try and how much an effort they are planning to exert, in order to perform the behaviour" (Ajzen, 1991). Software developers must have intention to

perform EC when developing their project before the competencies can be performed. Therefore, this study aims to investigate intention, which is relevant to this study for three reasons: first, they are based on the principles of social psychology; second, the focus on people's attitudes and perceptions; and third, they are concerned with how a person's attitudes and perceptions affect their behavioural outcomes when performing EC.

According to Icek Ajzen (1991), the major precursor to perform a behaviour successfully is the behavioural intention to perform an action. A software developer participating in several thought-stimulating tasks may be obstructed by a variety of circumstances, all of which contribute to the development of intention. Software developers with strong intention are more likely to put more effort in performing entrepreneurial behaviour.

Attitude is the degree to which a person sees a behaviour based on a positive or negative judgement of the behaviour (Ajzen, 1991). According to Charles (2015), attitude is a mental state of exerting readiness that is organised by experience and exerts a directional or dynamic impact on persons in relation to all objectives and situations with which it is associated. This was confirmed in the context of software development, where software developers may be hesitant to be disturbed to step out of their comfort zone when changes to the existing situation are made, particularly when new approaches are required, as being awkward and threatening, resulting in a high level of bias towards the behaviour (Turley & Bieman, 1994).

A person's perception of social pressure influences the ability to successfully perform or not, and a given behaviour is portrayed in the subjective norm (Ajzen, 1991). According to Bandura (1977), social learning theory, emphasising the importance of learning new behaviours through observing others, is sometimes known as role models. Generally, software projects are developed in groups (Holtkamp et al., 2015). Tus, their intention is highly influenced by their team members. The team members' activities and the attitudes toward one another stimulate entrepreneurial behaviour in the context of software development. It exhibits a degree of acceptance of teamwork, group cohesiveness, and the importance of sharing and cooperation in the practice of entrepreneurial abilities (Moe et al., 2010).

PBC encompasses a person's perspective of their ability to accomplish a behaviour, which is influenced by the environment in which they live (Bandura, 2006). According to Icek Ajzen (1991), resources, opportunities, enhancers, obstacles, and the degree of control a person feels he/she has over the behaviour, as well as the presence or absence resources. The ease or difficulty of a task is widely used to assess PBC construct (Ajzen, 2002). Apart from the TPB components, a few more factors play a role in identifying

behavioural intention. The self-efficacy is one of them, which is strongly linked to intention (Coduras et al., 2016), and EC have a direct impact on people's entrepreneurial intentions (Menke, 2018; Yaghoubi Farani et al., 2017).

Although PBC and self-efficacy appear to be theoretically identical, they are tested in various ways in practice (Parkinson et al., 2017). Another meaning of efficacy expectation is the assumption that one can successfully perform the action required to produce a specific result (Bandura, 2006). Self-efficacy refers to a person's inner beliefs about whether they possess the abilities they need to succeed, as well as their belief that they will be able to effectively transform those skills into the desired outcome (Charles, 2015). Even though there is a perceived societal need for a particular behaviour, if it is thought to be above a person's ability, he or she will not engage in it. It is commonly described as a person's ability to perform specific action or behaviour and their self-confidence (Parkinson et al., 2017).

EC are often described as a collection of abilities and knowledge that enable people to recognise, forecast, and capitalise on opportunities (Chandler & Hanks, 1993). According to Bird, (1995), EC are fundamental knowledge, motives, traits, self-image, positions, and abilities that are essential for a firm's set-up, survival, and/or development. Several studies defined the concept of EC as individual knowledge and competencies to perform a specific task successfully (Mitchelmore & Rowley, 2010; Noor Hazlina et al., 2010; RezaeiZadeh et al., 2017). The European Commission recently established an Entrepreneurship Competence Framework, which consists of three interconnected competence areas: the ability to transform ideas into opportunities, managing resources, and acting on ideas (European Commission, 2018). EC are a collection of skills that work together to support and maintain entrepreneurial behaviour (RezaeiZadeh et al., 2017). Empirical study from Man (2001) validated an EC model which consist of strategic thinking, conceptual thinking, relationship, opportunity, organising, commitment, and personal maturity. EC have been found to be major predictors of the three antecedents of entrepreneurial intention in a recent study (Menke, 2018). Another study found a direct link between EC and intention, as well as an indirect link via attitude, subjective norms, and perceived behavioural control (Yaghoubi Farani et al., 2017). Drawing on aforementioned factors, it is hypothesized that (Figure 1):

H1: Attitude has a positive effect on software developers' behavioural intention to perform entrepreneurial competencies.

H2: Subjective norms have a positive effect on software developers' behavioural intentions to perform entrepreneurial competencies.

H3: Perceived behavioural control has a positive effect on software developers' behavioural intentions to perform entrepreneurial competencies.

H4: Self-efficacy has a positive effect on software developers' behavioural intentions to perform entrepreneurial competencies.

H5: Entrepreneurial competencies have a positive effect on software developers' behavioural intention to perform entrepreneurial competencies.

H6: Entrepreneurial competencies have a positive effect on the attitude of software developers to perform entrepreneurial competencies.

H7: Entrepreneurial competencies have a positive effect on the subjective norms of software developers to perform entrepreneurial competencies.

H8: Entrepreneurial competencies have a positive effect on the perceived behavioural control of software developers to perform entrepreneurial competencies.

H9: Entrepreneurial competencies have a positive effect on the self-efficacy of software developers to perform entrepreneurial competencies.

H10: Attitude will mediate the relationship between entrepreneurial competencies and behavioural intention of software developers to perform entrepreneurial competencies.

H11: Subjective norms will mediate the relationship between entrepreneurial competencies and behavioural intention of software developers to perform entrepreneurial competencies.

H12: Perceived behavioural control will mediate the relationship between entrepreneurial competencies and behavioural intention of software developers to perform entrepreneurial competencies.

H13: Self-efficacy will mediate the relationship between entrepreneurial competencies and behavioural intention of software developers to perform entrepreneurial competencies.

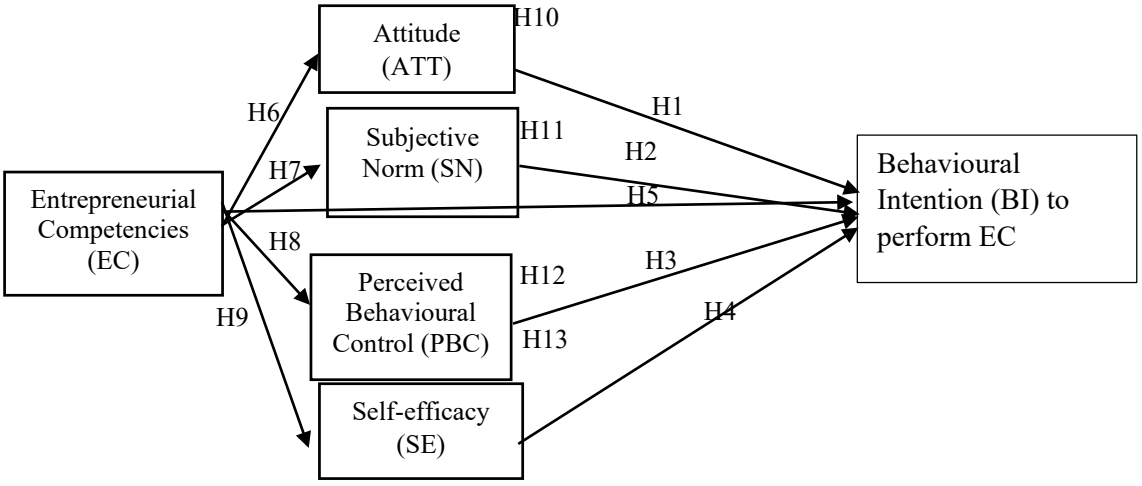

Figure 1. Proposed Theoretical Model

Methodology

The sampling in this study involves judgment of the researcher, where the respondents are chosen purposely so that they can provide reliable information to meet the objective of the study. Therefore, the non-probability approach using purposive judgemental sampling technique is adopted. The study population is software developers by profession.

The items for TPB constructs were adapted from previous studies (Ajzen, 2013; Solesvik et al., 2012; Tsordia & Papadimitriou, 2015), the self-efficacy items were adapted from (Nieuwenhuizen & Swanepoel, 2015), and the questionnaire items for EC were adapted from T. W. Man (2001) model and Noor Hazlina Ahmad (2007) model. 379 questionnaires were distributed, and 268 questionnaires were validated for further analysis.

Results

The model consists of both reflective and formative constructs. These constructs were assessed to verify reliability and validity before performing assessment of structural model. In this study, Partial Least Squares (PLS) algorithm method was applied to examine the reliability and validity of every individual construct. However, different tests are used to evaluate the validity and reliability of both reflective and formative assessment approaches. For a reflective construct, the test measured the internal consistency, indicator reliability and convergent validity (Hair Jr et al., 2014). When evaluating formative constructs, outer weight significance and relevance and collinearity among indicators are considered (Hair Jr et al., 2014).

Assessment of Reflective Constructs

The first measurement is to examine internal consistency. Two assessments, such as Composite Reliability (CR) and Cronbach's Alpha (CA), are commonly used to evaluate internal consistency. Construct reliability is assessed by using Composite Reliability (CR) and Cronbach's Alpha (CA) in this study. CR presumes value greater than 0.6 for a specific construct and should be retained for further analysis. However, a CR value of 0.95 and above is considered unsatisfactory (Hair Jr et al., 2014). According to Hair et al., (2014), CA value of 0.6 or greater is acceptable. In this study, both tests verify that internal consistency between items and constructs were met. Table 1 shows CR value and CA value for each construct.

Table 1
Construct Internal Consistency

Construct	Composite Reliability (CR)	Cronbach's Alpha (CA)
Attitude	0.8918	0.8354
Subjective Norm	0.8907	0.8473
Perceived Behaviour Control	0.8398	0.7714
Self-efficacy	0.8634	0.7870
Behavioural Intention	0.9164	0.8746

Next is to perform indicator reliability test to measure the relationship between the measurement items and a single construct commonly known as latent variable. The reliability is obtained from factor loading of reflective constructs. The item loadings are in the range of 0.4 and 0.7 should only be removed if the item deletion affects the AVE and/or composite reliability (Hair Jr et al., 2014). In general, indicator reliability is considered acceptable when the reading is at minimum 0.7 (Hair Jr et al., 2014). However, it accepts a 0.4 as cut-off value. When the item loadings are in the range of 0.4 and 0.7 should only be removed if the item deletion affects the AVE and/or composite reliability (Hair Jr et al., 2014). Therefore, the items with values less than 0.4 were removed, including ATT3 (0.329), SN1 (0.058), and PBC1 (0.383).

Convergent Validity (CV) is referred as the degree to which measurement items together measuring the construct (Petter et al., 2007). As for this study, CV is obtained by the item factor loading and the average variance extracted. Whenever the factor outer loading is 0.5 or above, it is considered acceptable (Hair Jr et al., 2012).

The value of AVE is 0.5, which is considered an acceptable value (Fornell & Larcker, 1981). In this study, all items' loadings are above 0.5, thus all items were retained for further analysis.

Table 2
Factor Loading and AVE

Construct	Indicator Name	Factor Loading	AVE
Attitude	ATT1	0.9287	0.7243
	ATT2	0.9237	
	ATT4	0.9093	
	ATT5	0.9114	
	ATT6	0.5383	
Subjective Norm	SN2	0.6400	0.6706
	SN3	0.7863	
	SN4	0.8750	
	SN5	0.8624	
	SN6	0.8580	
	SN7	0.8572	
Perceived Behaviour Control	PBC2	0.8406	0.5539
	PBC3	0.5994	
	PBC4	0.6780	
	PBC5	0.7310	
	PBC6	0.8662	
Self-efficacy	SE1	0.6930	0.6221
	SE2	0.9153	
	SE3	0.9110	
	SE4	0.5967	
Behavioural Intention	BI1	0.6766	0.7355
	BI2	0.8958	
	BI3	0.9182	
	BI4	0.9155	

Assessment of Formative Constructs

The measures for formative construct are predicated on outer weights, where the value for formative items is calculated by multiplying the original item values by their PLS weights (Gaskin & Lowry, 2014). The EC consisting Strategic Thinking (ST), Conceptual Thinking (CT), Relationship (R), Opportunity (OPP), Organising (ORG), Commitment (COM), and Personal Maturity (PM) were evaluated by using VIF criteria and item outer weights. According to Hair *et al.*, (2011), each indicator's variance inflation factor (VIF) should be less than 5. Furthermore, the outer weights obtained must be bigger than zero and meet the 1.96 t-value condition (Hair, J. F. et al., 2014; Kwong & Wong, 2013). All formative construct indicators meet the t-value and VIF criterion; hence, all items were kept. Table 3 shows the formative measures used in this investigation.

Table 3
Assessment for Formative Constructs

Construct	Item	VIF	Outer Weights	Outer Loading	Significance outer weights (t-value >1.96
Strategic Thinking	ST1	2.1797	0.2761	0.6374	2.4609
	ST2	2.0501	0.5437	0.8455	3.7000
	ST3	1.6086	0.2739	0.6369	1.9748
	ST4	1.2141	0.5202	0.7920	6.3798
Relationship	R1	1.6168	0.3061	0.5049	3.0633
	R2	1.5888	1.1100	0.4212	2.8701
	R3	1.7255	0.8421	0.9850	4.2241
	R4	1.7452	0.2014	0.6027	3.2783
Conceptual Thinking	CT1	1.2401	0.1930	0.4549	2.1770
	CT2	1.1209	0.1657	0.3887	3.2094
	CT3	1.7657	0.7587	0.9667	4.8508
	CT4	1.5122	0.2905	0.7458	2.9115
Organising	ORG1	1.8181	0.4546	0.7895	5.0104
	ORG2	3.0984	0.5700	0.7805	1.9805
	ORG3	1.5841	0.3570	0.4988	3.8245
	ORG4	1.7579	0.5709	0.8789	5.3735
Opportunity	OPP1	1.3332	0.4367	0.7019	5.4801
	OPP2	1.2941	0.0434	0.4282	3.7290
	OPP3	1.2641	0.1438	0.4767	2.6076
	OPP4	1.3255	0.7384	0.8715	4.1768
Commitment	CM1	1.2999	0.4967	0.8123	3.4267
	CM2	1.4091	0.4301	0.7949	2.6206
	CM3	1.4537	0.3340	0.7622	2.4871
Personal Maturity	PM1	1.1002	0.6322	0.7811	4.6594
	PM2	1.0503	0.6731	0.2134	2.6634
	PM3	1.1562	0.4563	0.7930	3.5926
	PM4	1.1109	0.3890	0.5678	2.1540

Research Hypothesis

This research verified the hypotheses by evaluating the path coefficient by means of t-statistics. Path coefficient - assessed using PLS → Calculation Results → Path Coefficient. The t-values were computed by running bootstrap sampling approach with 5,000 samples as it was recommended by (Hair Jr et al., 2016). In order to accept a hypothesis, the value of path coefficient should be more than 0.1 to justify to a relationship (Hair et al., 2011). Finding the path coefficient is presented in the Table 4.

Table 4
Path Coefficient

Hypothesis	Path	Path Coefficient (β)	t-value	p-value	Result
H1	ATT □BI	0.1583	1.7353*	0.0828*	Significant
H2	SN □ BI	-0.2284	2.4306	0.0151	Not
H3	PBC □ BI	0.5608	12.4786***	0.0000***	Significant
H4	SE □ BI	0.1066	1.6980*	0.0896*	Significant
H5	EC → BI	0.1883	1.7383*	0.0822*	Significant
H6	EC → ATT	0.4223	6.4852***	0.0000***	Significant
H7	EC → SN	0.3640	5.8744***	0.0000***	Significant
H8	EC → PBC	0.5023	8.6954***	0.0000***	Significant
H9	EC → SE	0.6313	10.6308***	0.0000***	Significant
H10	EC → ATT → BI	0.0714	1.2508	0.2111	Not
H11	EC → SN → BI	-0.1256	2.2585	0.0240	Not
H12	EC → PBC → BI	0.3211	8.3968***	0.0000***	Significant
H13	EC → SE → BI	0.0396	0.7793	0.4358	Not

Note: t-value > 1.65= *, t-value > 1.96 = **, t-value >2.58=***

The results show that among the five determinants of BI attitude, PBC, SE and EC have significant effect on the BI of software developers to perform EC while subjective norm does not. The H5, H6, H7, H8 and H9 show the effect of EC on the antecedents of behavioural intention. The exogenous variable, EC influence on the endogenous variable, behavioural intention by the mediating antecedents of intention are displayed in H10, H11, H12 and H13. All hypotheses were statistically significant except H2, H10, H11 and H13.

Discussion

The findings suggest that the model is fairly efficient to predict BI to perform EC within software development context. Among all the three factors of TPB, PBC shows an extreme positive result between PBC and software developers' intention to perform EC at ($\beta = 0.5608$, t-value >2.58 and p-value < 0.01), supporting hypothesis 3. A previous study mentions PBC as a poor predictor of a behaviour compared to self-efficacy (Parkinson et al., 2017). However, the findings oppose the argument and prove that PBC has the strongest predictive power that influences the intention of software developers to perform EC. The findings are consistent with (Paul et al., 2016), where there is positive influence towards intention. In addition, findings indicate that a subjective norm has a negative impact on the intention of software developers. This means that the opinions of others are not contributing to the intention of software developers to perform EC.

EC demonstrate significant and positive impact on behavioural intention, with statistics, ($\beta = 0.1883$, t-value > 1.65 and p-value < 0.1). Findings of a recent entrepreneurship study provide additional support for this argument, i.e. the heart of entrepreneurship is entrepreneurial competencies, and they have a significant impact on decision-making and intention of individuals (Yaghoubi Farani et al., 2017), according to Kolvereid and Moen (1997) as well. Self-efficacy has a positive influence on software developers' intention at ($\beta = 0.1066$, t-value>1.65 and p-value < 0.1). The findings are similar to a previous study indicating that self-efficacy influences the intention of an individual to perform a behaviour (Moriano et al., 2012). Findings reveal that software developers are confident when they want to perform entrepreneurial competencies. Based on the PBC level and intention revealed in the study, the cohesive working environments are examined in order to see whether they are promoting or hindering software developers to perform entrepreneurial competencies successfully when developing a software product.

Conclusion

The findings add support to the Malaysia's National Entrepreneurship Policy (NEP) to transform the country into a world-class entrepreneurial nation by 2030. The study found that the extension of TPB model with EC and self-efficacy is fairly efficient when measuring the intention of software developers to perform EC successfully. The findings validate the extension

made to the TPB and confirm the relevance of this theory to the study. Furthermore, this research provides concrete evidence for the model's applicability as a guide to promote entrepreneurial competencies among software developers in Malaysia. The findings suggest that social influence is not really a factor that has to be considered when practising entrepreneurial competencies among software developers.

New research is needed to assess other determinants that affect software developers' intention to perform EC. For example, factors such as curriculum design and family background should be explored to investigate the determinants. A longitudinal research design should be considered in order to examine these factors and the determinants of the study. A longitudinal study is necessary to accurately depict the impact of EC on observed variances in the elements of the TPB and behavioural intentions in the course of time.

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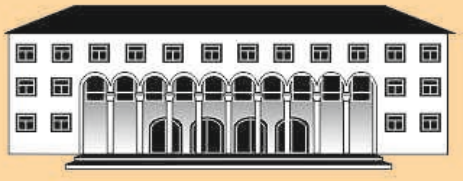

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