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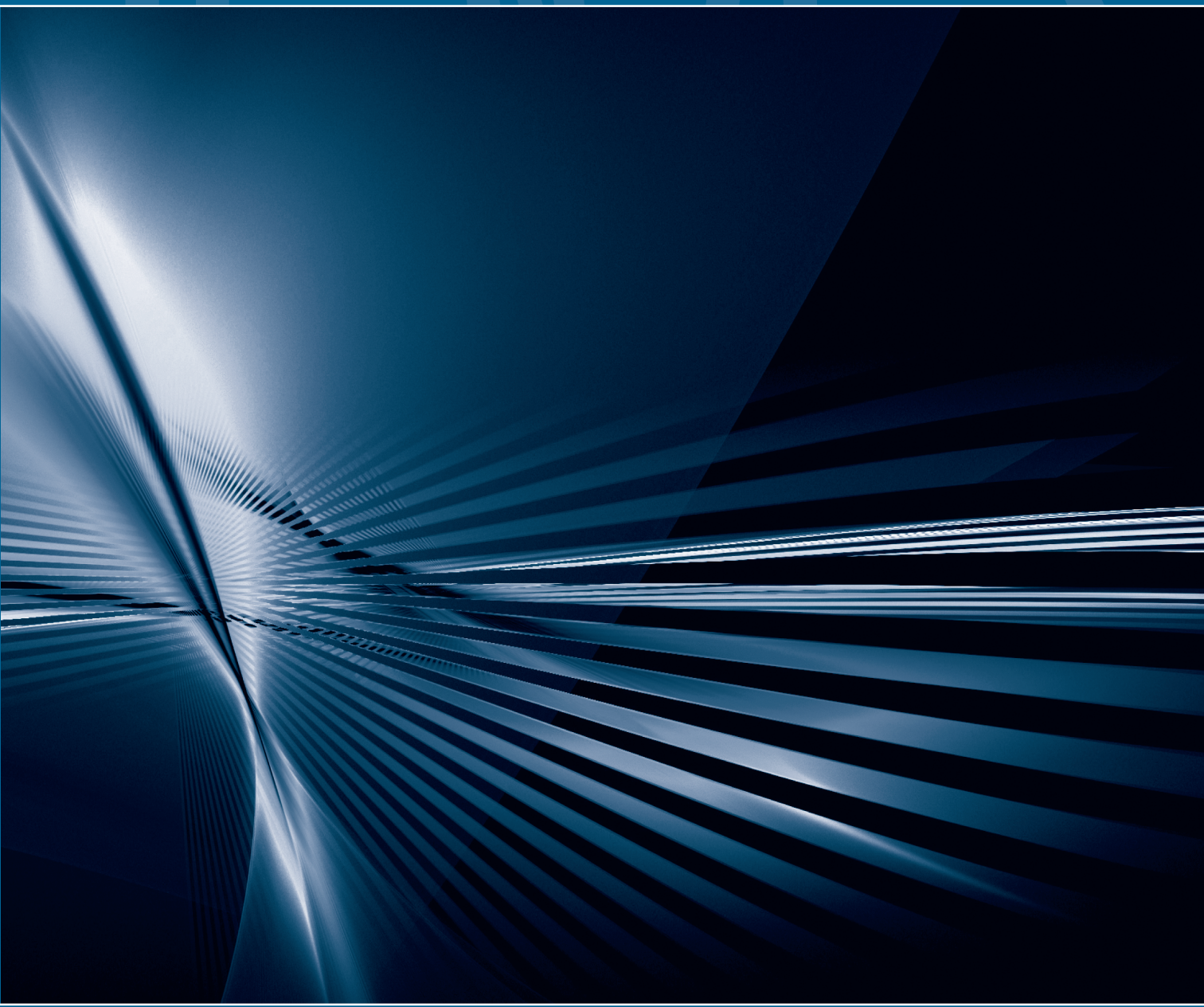

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ORGANIZACIJA

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Understanding the Structural Complexity of Induced Travel Demand in Decision-Making: A System Dynamics Approach

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Background and purpose: Induced travel demand (ITD) is a phenomenon where road construction increases vehicles' kilometers traveled. It has been approached with econometric models that use elasticities as measure to estimate how much travel demand can be induced by new roads. However, there is a lack of "white-box" models with causal hypotheses that explain the structural complexity underlying this phenomenon. We propose a system dynamics model based on a feedback mechanism to explain structurally ITD.
Methodology: A system dynamics methodology was selected to model and simulate ITD. First, a causal loop diagram is proposed to describe the ITD structure in terms of feedback loops. Then a stock-flows diagram is formulated to allow computer simulation. Finally, simulations are run to show the quantitative temporal evolution of the model built.
Results: The simulation results show how new roads in the short term induce more kilometers traveled by vehicles already in use; meanwhile, in the medium-term, new traffic is generated. These new car drivers appear when better flow conditions coming from new roads increase attractiveness of car use. More cars added to vehicles already in use produce new traffic congestion, and high travel speeds provided by roads built are absorbed by ITD effects.
Conclusion: We concluded that approaching ITD with a systemic perspective allows for identifying leverage points that contribute to design comprehensive policies aimed to cope with ITD. In this sense, the model supports decision-making processes in urban contexts wherein it is still necessary for road construction to guarantee connectivity, such as the case of developing countries.

Keywords: *induced travel demand; system dynamics; decision-making; dynamic modeling.*

1 Introduction

Mobility is the necessity to travel that is derived from the desire to participate in economic and social activities in urban areas. Traveling between different locations involves an expenditure of time. However, negative implications appear when movements on roads are accomplished by spending more time than usual due to traffic congestion (Hills, 1996). In intuitive decision-making processes, road construction is a well-known policy that increases travel speeds and reduces travel delays (Hong et al., 2011; Noland and Lem, 2002). Nevertheless, evidence of a short- and medium-term correlation between road construction and travel demand has been found (Graham et al., 2014; Hanse, 1995). This phenomenon is known as induced travel demand (ITD) in which new roads, expressed as linear

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kilometers, induce increases in the number of kilometers traveled by vehicles.

ITD calls into question the effectiveness of road construction as a single and sufficient policy to address traffic congestion (Ladd, 2012). Several studies have approached ITD with econometric models that use elasticities as measure to estimate how much travel demand can be induced by new roads (Currie and Delbosc, 2010; Handy, 2014; Litman, 2015; Noland, 2004; Özuysal and Tanyel, 2008). Those models are built with forecasting purposes to match sets of outputs between specified ranges of accuracy without claims of causality in their structure (Barlas, 1996). They do not focus on providing structural explanations of the counterintuitive behavior in which mobility tends to be saturated despite building new roads.

Although econometric models corroborate the existence of ITD and quantify it, explaining this phenomenon structurally allows designing comprehensive policies that go beyond road construction to effectively address traffic congestion. However, to do this, ITD should be approached from a systemic perspective to suggest sizing up this phenomenon, placing it in a wide enough context, and thinking about it as a system in the same way that every social concern must be approached (Bunge, 2014). This implies recognizing and defining elements that interact between road construction and motorized travel demand as elements that are strongly linked and influence each other in a whole system and whose interactions determine ITD behavior. The latest avoids reductionist thinking in which linear cause-effect relationships are studied in isolation.

In this sense, "white-box" models can propose representations about the structural complexity of ITD. Through system dynamics (SD) models, which are "causal-descriptive" models, it is possible to formulate statements of how ITD actually works. These models are built to understand why certain phenomena occur. This question is answered using a feedback structure that explains the occurrence of ITD over time (Sterman, 2000); this means that the feedback structure produces a behavior that can be similar to ITD behavior. Therefore, the feedback mechanism is conceived as a dynamic hypothesis of ITD based on a fundamental premise of the systems dynamics paradigm: to similar causal structures correspond similar behaviors (Andrade et al., 2001; Forrester, 1971).

In this paper, we highlight the structural complexity underlying ITD. These insights are based on an SD model whose feedback structure is a dynamic hypothesis that explains and simulates ITD by road construction. The SD model represents a complex mobility phenomenon that is corroborated and measured through econometric models using a systemic approach. This means including the linear relationship between kilometers traveled and kilometers built within a structure of cyclical influence from which ITD dynamically emerges using SD modeling tools.

2 Bibliographic review

The phenomenon of induced travel demand (ITD) was recognized even before the automobile age (Ladd, 2012). However, serious attention began only in the 1980s, especially in the UK (Goodwin, 1992). During that time, scholars in the USA carried out statistical works to discuss and corroborate this phenomenon (Cervero, 2001; Noland, 2001). Since the 1990s, several studies using econometric models have produced more solid evidence about the existence of ITD (Duranton and Turner, 2011; Handy, 2014; Hymel et al., 2010; Litman, 2010; Noland, 2004; Özuysal and Tanyel, 2008). These confirmations contradict the long-term benefits of road construction on mobility. As a result, road construction in developed countries is no longer an exclusive policy to reduce traffic congestion.

However, in developing countries, rapid urban sprawl, high population growth, raised motorization rates and great traffic congestion have promoted a perceived need of more roads among transport policy-makers. Currently, these countries invest huge budgets for new and better roads to solve the issues described above. Nevertheless, despite available evidence about ITD in countries in Europe and North America, we have not found works that discuss ITD and evaluate its possible implications in developing countries under their current road construction scenarios. It is probable that if econometric models were used to assess how much travel demand can be induced by road construction projects, the results would show how the building policy increases the quantity of motorized travel in a long run time horizon.

Assuming as a fact the increment of motorized travel after road construction, regardless of the precise quantity of such increases, a representation with a system dynamics (SD) model of ITD provides a modeling tool that improves the decision-making process in developing countries. The SD model enhances the level of understating about the structural complexity of ITD. The better this phenomenon is known this phenomenon, the better comprehensive policies in mobility would be designed, taking into account that road facilities are still necessary to guarantee connectivity in developing urban cities.

We performed a bibliographic review that covers the period between 1990 and 2015. All papers reviewed were made under an econometric approach wherein elasticities are the primary measure to corroborate and quantify ITD. However, we did not find papers with a "causal-descriptive" or system dynamics approach. This supports the statement that there is a lack of "white-box" models with causal hypothesis to represent the structural complexity of ITD, based on available statistical evidence provided by econometric models.

3 Materials and Method

System dynamics (SD) is a methodology based on feedback control theory equipped with mathematical simulation models by computer, which uses linear and non-linear differential equations. Jay Forrester at Massachusetts Institute of Technology developed this approach in the 1960s. Since then, it has been employed to address complex issues in various fields such as urban dynamics (Forrester, 1969), business and management (Sterman, 2000), education and learning (Andrade et al., 2014; Forrester, 1994), and economy and environment (Ford, 1999). The purpose of SD in these areas has focused on explaining structure and modelling complex phenomena that are represented as systems for understanding their behavior over time.

Building an SD model involves an iterative process. In the progression from one step to the next, the modeler moves backward and forward through each methodological tool that SD offers to create a model as an abstraction of a real phenomenon (Sterman, 2000). For this paper, we assumed these methodological tools as a set of languages that each represents a particular view of the model (Andrade et al., 2001). This methodological assumption corresponds to the modeling methodology of "five languages" that was proposed by Hugo Andrade et al. (2001) and is shown in Figure 1. The model was built with Evolución 4.5[1], a software platform developed by the SIMON[2] research group at Universidad Industrial de Santander (Colombia) to build SD models.

4 Results

In this section, we expose the model that was built using each language of Figure 1. The purpose of this model is to propose a dynamic explanation in terms of circular causality of induced travel demand as emerging phenomenon between road construction and motorized travel demand. We did not take into account alternative means of transport, and the benefit of road construction inducing more travel demand is travel speed. Moreover, a specific urban context with mobility features is used to calibrate the basic model parameters.

4.1 System verbalization

The Metropolitan Area of Bucaramanga (MAB) is a metropolitan zone located in the department of Santander, Colombia, with an estimated population of 1,113,522 people. It is composed of four cities: Bucaramanga (capital city of Santander), Floridablanca, San Juan de Girón and Piedecuesta. They are linked geographically and commercially, and transportation is a key element that influences the way

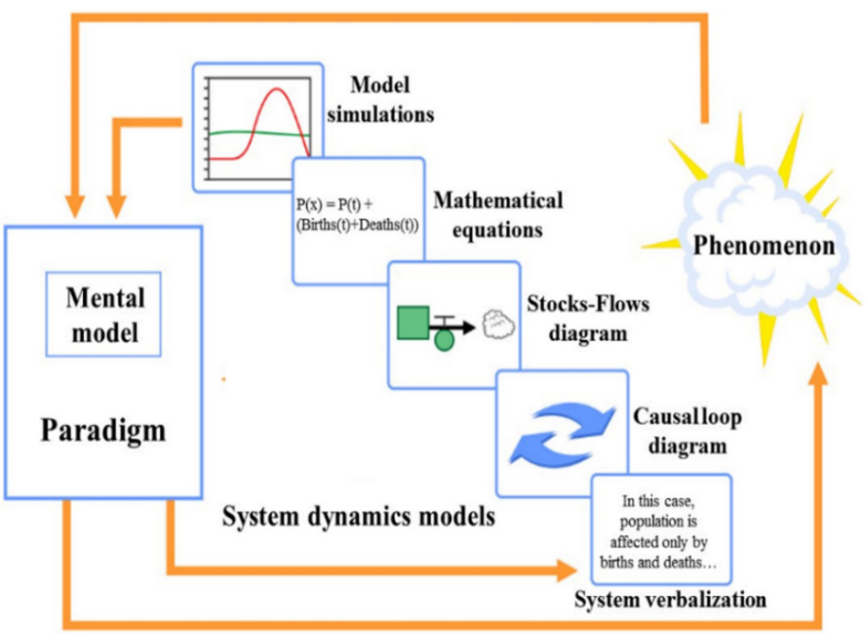

Figure 1: The methodology of "five languages" used to build the SD model. Source: adapted from (Andrade et al., 2001)

1 More information about Evolución software is available at: Andrade, H. H., Lince, E., Hernandez, A. E., Monsalve, A. J. (2010). Evolución: herramienta software para modelado y simulación con dinámica de sistemas. Revista de Dinámica de Sistemas Vol. 4, Núm. 1, ISSN: 0718-1884.

2 For more information about SIMON research group, please visit www.simon.uis.edu.co

in which people do their daily activities along the MAB. MAB'S fleet consists mostly of private vehicles (cars, vans and campers) that represent 38% of the total fleet. Additionally, there is a motorization rate of 442 vehicles per 1,000 people (Observatorio Metropolitano de Bucaramanga, 2014); meanwhile, road supply has built approximately 1,300 kilometers of road, and several road construction projects are underway that require great budgets to increase the number of kilometers available (Secretaría de Infraestructura de Bucaramanga, 2001). However, according to the evidence reviewed of induced travel demand in cities abroad, we suggest that this one-side policy will generate, at best, modest results in MAB.

4.2 Causal Loop Diagram (CLD)

The proposed CLD can be seen in Figure 2, and a brief description of each variable is shown below. According to Figure 2, the CLD includes two types of travel conditions on roads: the first type corresponds to potential conditions. They represent the level of service on roads calculated on the basis of vehicles that the kilometers built can hold at average flow conditions, including the whole fleet of private vehicles; this includes cars in use and cars that do not travel because of traffic congestion[3]. The second type corresponds to real conditions that represent the level of service on roads only based on cars traveling and the road capacity in terms of vehicles that the kilometers built can support.

- *Kilometers Built*: This is the available road infrastructure expressed as linear kilometers.
- *Road Congestion Index*: This represents the state of mobility as a ratio between kilometers traveled by cars and kilometers built. This index takes values between zero and one. Values closer to zero represent uncongested mobility. Values closer to one correspond to traffic congestion on the available road infrastructure.
- *Fleet Growth*: This represents the average growth of private vehicles in the Metropolitan Area of Bucaramanga. The flow rate at which the fleet increases is influenced by a motorization rate of 442 vehicles per 1.000 people. This growth rate includes social and economic elements that also increment travel demand growth and that are not specified within this model.
- *Potential Level of Service (LoS):* Thus represents the potential flow conditions on roads that change depending on values of a ratio, a dimensionless load factor, between fleet growth and vehicles that the kilometers built can hold at an average flow of 3,200 vehicles/hour and a service travel speed of 60 kilometers/hour. The scale of LoS has six discrete values ranging from A to F, which can be seen in Table 1. Each discrete range is associated with an average range of potential travel speeds.

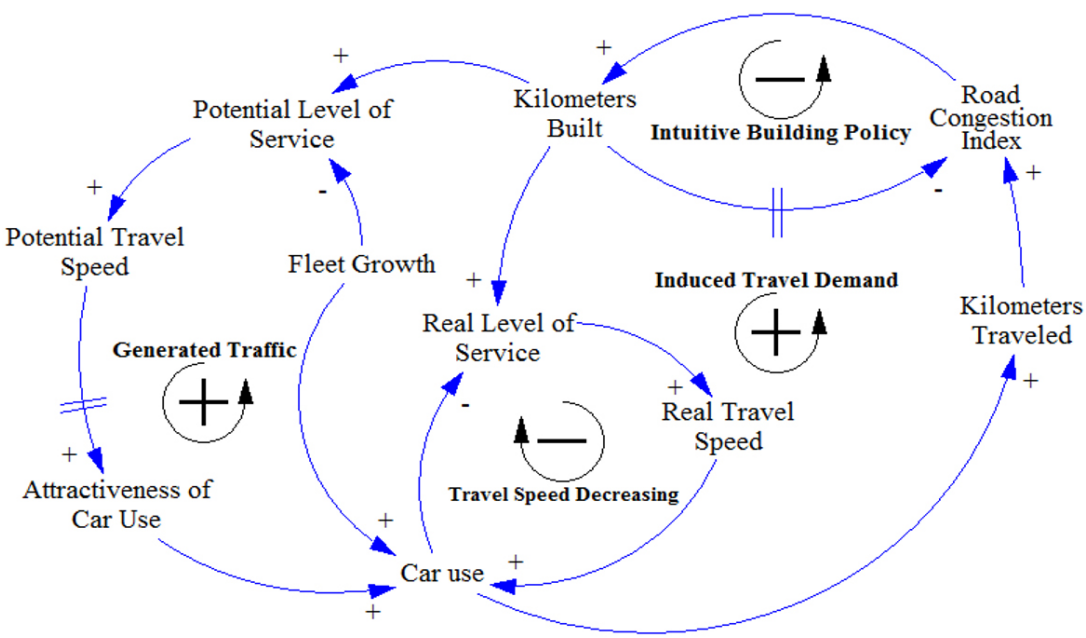

Figure 2: Causal loop diagram: feedback mechanism that structurally explains induced travel demand by road construction

3 Those cars that do not travel because of traffic congestion correspond to discretionary riders who have the option of traveling in more than one means of transport. When mobility is congested, discretionary riders do not use private vehicles; they tend to use other means of transport, such as public transport.

- *Potential Travel Speed*: This is the potential speed at which vehicles could travel depending on the Potential Level of Service.
- *Attractiveness of Car Use*: This variable represents people's satisfaction with respect to Potential Travel Speed that decreases or increases the number of cars in use.
- *Car use*: This represents the number of vehicles traveling on roads.
- *Real Level of Service (LoS):* This is used to assess real flow conditions on road infrastructure that change depending on a dimensionless ratio between cars already in use and the vehicles that the kilometers built can hold at an average flow of 3,200 vehicles/hour and a service travel speed of 60 kilometers/hour. The scale of LoS has six discrete values ranging from A to F, which can be seen in Table 1.
- *Real Travel Speed*: This is the real speed at which vehicles are traveling on roads depending on the Real Level of Service.
- *Kilometers Traveled*: This is the total kilometers traveled by cars traveling on roads.

According to Figure 2, there are four causal loops. Two of them are reinforcing loops, and the other two are balancing loops. They are described below:

- "Intuitive Building Policy" balancing loop: This loop represents the intuitive decision-making process in which more roads are built to reduce traffic congestion. When the road congestion index (RCI) increases, more kilometers are built to supply more road space, and therefore, traffic congestion is released.
- "Travel Speed Decreasing" balancing loop: This loop depicts how higher travel speeds and benefit of new roads are absorbed by car use. When there are more cars on roads, flow conditions decrease, which results in low travel speed. Lower travel speeds decrease car use until new roads are built again. When this happens, higher travel speeds come back because more road space is available.
- "Generated Traffic" reinforcing loop: In this causal loop, if more roads are built, then the potential level of service increases. Then, potential travel speed increments and attractiveness of car use grows. Consequently, more cars are used, and new traffic is generated, which would happen if new roads were not built. Therefore, there are more cars traveling on new roads, and kilometers traveled increases. As a result, the RCI increases, which induces more road construction.

Table 1. Level of Service and travel speeds. Source: adapted from (Cerquera, 2007)

Level of Service	Operating Conditions	Load Factor	Average Travel Speed
A	Individual users are virtually unaffected by others in the traffic stream. Freedom to select desired speeds is extremely high.	0.00 to 0.60	70 km/h > 50 km/h
B	This represents the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable.	0.61 to 0.70	49 km/h > 40 km/h
C	This represents the range of stable flow, but the selection of speed is affected by the presence of others.	0.71 to 0.80	39 km/h > 36 km/h
D	This represents high-density but stable flow. Speed is severely restricted.	0.81 to 0.90	35 km/h > 30 km/h
E	All speeds are reduced to a low but relatively uniform value. The freedom to drive within the traffic stream is extremely difficult.	0.91 to 1.00	29 km/h > 26 km/h
F	This represents forced or breakdown flow.	Greater than 1.00	25 km/h

- "Induced Travel Demand" reinforcing loop: In this loop, when more kilometers are built, more road space is provided. This increases the real level of service and improves real travel speeds. Then, flow conditions for cars that are already in use are improved and vehicles tend to use more new routes and spend more time on them, which means that more kilometers are traveled. Finally, the total numbers of kilometers traveled grow, and RCI increases again. Consequently, more road construction is influenced by higher RCI values.

4.3 Reference mode

Based on the causal loop diagram (CLD) proposed, the stocks-flows diagram is formulated to run dynamic simulations of ITD behavior. Qualitative analysis of interactions between CLD's feedback loops allows for a discussion of the expected behavior for simulations of the stocks-slows diagram. This reference pattern, known as reference mode, provides a point of reference during the modeling process, enabling us to stay on track of the model validation and its quantitative results (Ford, 1999).

The reference mode (RM) for the causal loop diagram of section 4.2 can be seen in Figure 3. It is proposed by Litman (2015), and it depicts the generated traffic caused by road construction. According to the RM, traffic grows when roads are uncongested (projected traffic growth line), but the growth rate declines as congestion appears (blue curve), which means that discretionary riders stop using their vehicles. If more roads were built, car use would increase, and traffic would grow again. This additional traffic is called generated traffic (red curve).

4.4 Simulation model

The causal loop diagram (CLD) gives a qualitative representation of the model that is useful for describing the ITD structure in terms of the feedback loops formulated. However, decision-making processes require formulating and testing policies in the model to think about their possible effects on ITD. The stocks-flows diagram is the mathematical representation of the CLD using a graphical language of accumulators and pipes, which allows for computer simulation. The stocks-flows diagram can be seen in Figure 4. In addition, types, units and formulas of each variable are shown in Table 2.

The approach here is based on linking differential equations, which is presented in terms of a graphical language of 'stocks' and 'flows' that keeps the model transparent and easy to understand. Stocks are depicted by rectangles, suggesting a box that holds the content. Flows can be inflow to a stock or outflow from a stock. They are represented with valves that control the rate of flow into or out of the stock. Undergirding the notation of 'stocks' and 'flows' is the mathematical notation that shows how the stock is the integral of inflow minus outflow starting with an initial level of stock. As a stock with inflows and outflows is linked to other stocks and flows, the system structure is described by a set of linked linear and non-linear differential equations.

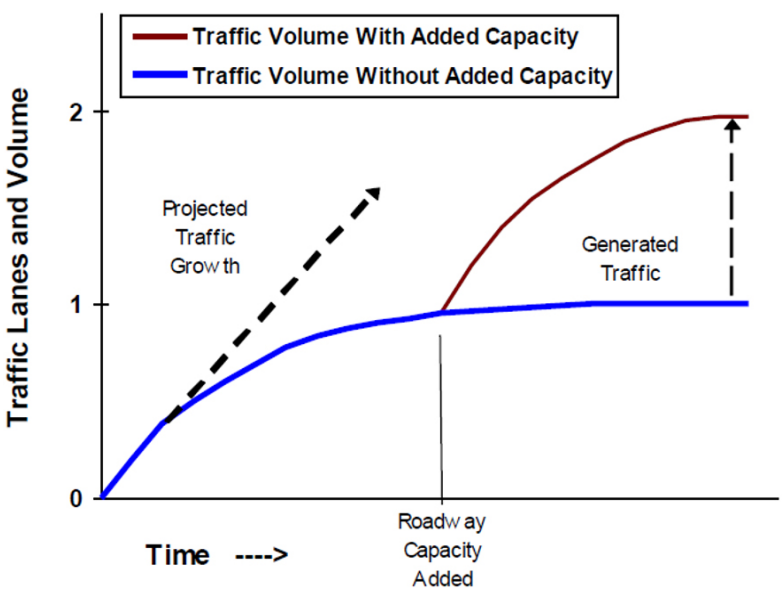

Figure 3: The reference mode for the causal loop diagram proposed in section 4.2. Source: adapted from (Litman, 2015)

4.5 Model simulations

Having formulated both a causal loop diagram and a stocks-flows diagram, this section presents model simulations. These are the quantitative temporal evolution of the model that we have built. The behaviors observed in the graphs below emerge from dynamic relationships between the feedback loops that are described in section 4.2. Before running simulations, we assumed a congested mobility; with this condition, we evaluated two simulation scenarios: a road construction scenario to analyze how new roads induce more motorized travel demand, and a not construction scenario to depict normal travel demand growth without ITD. These hypothetical scenarios are necessary because ITD cannot be evaluated simply by looking

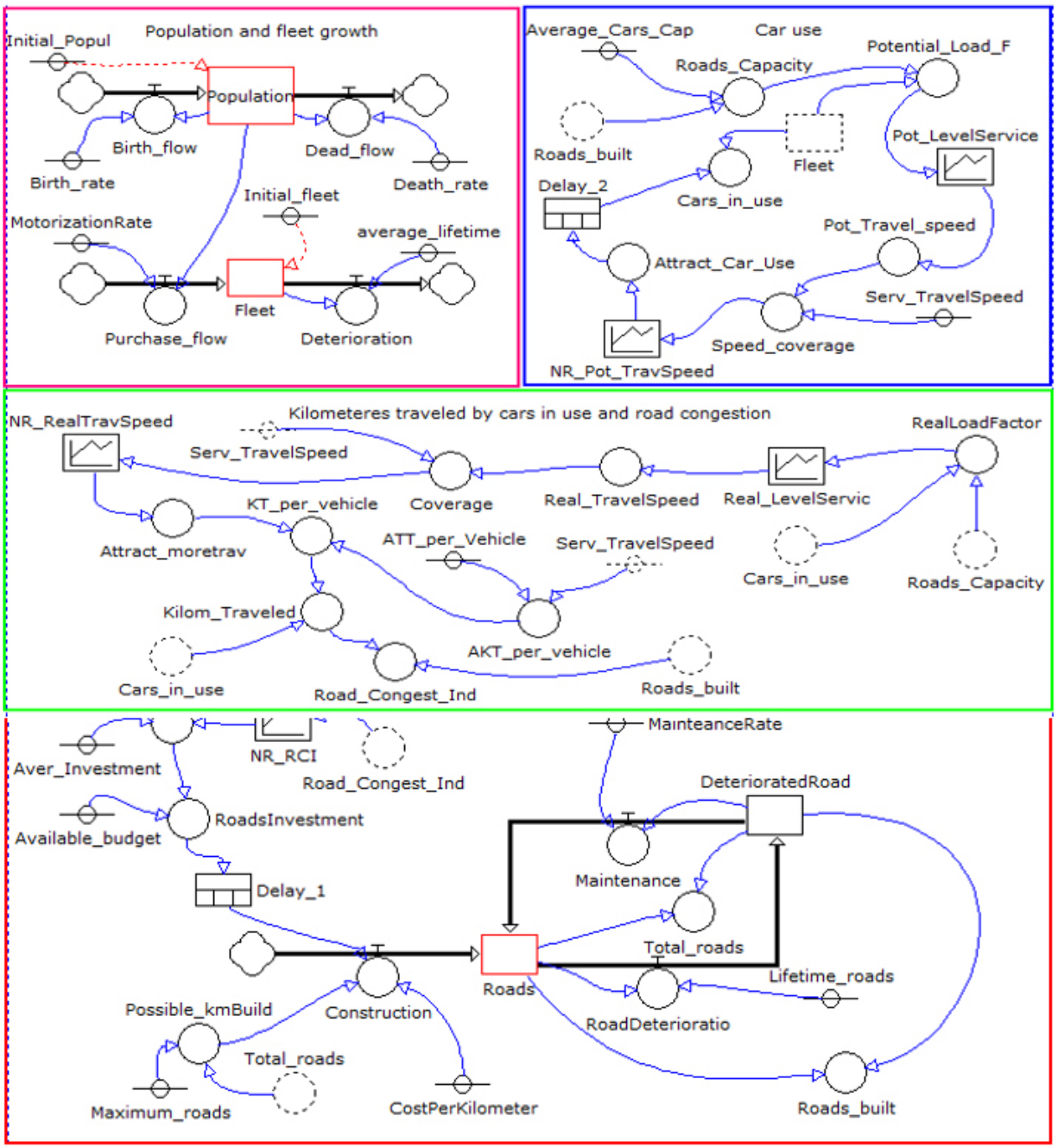

Figure 4: The stocks-flows diagram built on the basis of the feedback structure proposed in section 4.2

Table 2: Equations of the stocks-flows diagram

Type	Variable names	Units	Formulas
Levels	Population	People	Initial_Popul
	Fleet	Vehicles	Initial_fleet
	Roads	Kilometers	1319
	DeterioraedRoads	Kilometers	100
Flows	Birth_flow	People/year	Birth_rate*Population
	Construction	Kilometers/year	MIN(Possible_kmBuild,(Delay_1/CostPerKilometer))
	Dead_flow	People/year	Population*(Death_rate)
	Deterioration	Vehicles/year	Fleet/average_lifetime
	Maintenance	Kilometers/year	DeterioratedRoad/MaintenanceRate
	RoadDeterioratio	Kilometers/year	Roads/Lifetime_roads
	Purchase_flow	Vehicles/year	Population*MotorizationRate
Parameters	ATT_per_Vehicle	Hour	0.53
	Available_budget	US dollars	510638297
	Aver_Investment	Percentage fraction	1
	Average_Cars_Cap	Vehicles/Kilometer	53
	Birth_rate	Dimensionless/year	0.1911
	CostPerKilometer	US dollars	1200
	Death_rate	Dimensionless/year	0.0556
	Initial_Popul	People	1113522
	Initial_fleet	Vehicles	492299
	Lifetime_roads	Years	15
	MainteanceRate	Years	1.1
	Maximum_roads	Kilometers	500000
	MotorizationRate	Vehicles/people	0.023
	Serv_TravelSpeed	Kilometers/hour	60
	average_lifetime	Years	12
Auxiliary variables	AKT_per_vehicle	Kilometers	(ATT_per_Vehicle*Serv_TravelSpeed)
	Attract_Car_Use	Dimensionless	NR_Pot_TravSpeed
	Attract_moretrav	Dimensionless	NR_RealTravSpeed
	Budget_allocated	Percentage fraction	NR_RCI*Aver_Investment
	Cars_in_use	Vehicles	Fleet*Delay_2
	Coverage	Dimensionless	Real_TravelSpeed/Serv_TravelSpeed
	KT_per_vehicle	Kilometers/vehicle	(AKT_per_vehicle*Attract_moretrav)
	Kilom_Traveled	Kilometers	(Cars_in_use* KT_per_vehicle)
	Possible_kmBuild	Kilometers	IF(Maximum_roads-Total_roads<=0,0,Maximum_ roads-Total_roads)
	Pot_Travel_speed	Kilometers/hour	Pot_LevelService
	Potential_Load_F	Dimensionless	Fleet/Roads_Capacity
	RealLoadFactor	Dimensionless	Cars_in_use/Roads_Capacity
	Real_TravelSpeed	Kilometers/hour	Real_LevelServic
	Road_Congest_Ind	Dimensionless	(Kilom_Traveled/Roads_built)/8045
	RoadsInvestment	US dollars	Available_budget*Budget_allocated
	Roads_Capacity	Vehicles	(Roads_built*Average_Cars_Cap)
	Roads_built	Kilometers	(Roads+(0.5*DeterioratedRoad))
	Speed_coverage	Dimensionless	Pot_Travel_speed/Serv_TravelSpeed
	Total_roads	Kilometers	DeterioratedRoad+Roads

Table 2: Equations of the stocks-flows diagram (continued)

Nonlinear Relationships	NR_Pot_TravSpeed	Dimensionless	INTSPLINE (2,0,0.05,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.7,0.7,0.8,0.85,0.9,0.9,0.9,0.95,1,1,1,1,1,1,1,1,1,1,1)
	NR_RCI	Dimensionless	INTSPLINE (2,0,0.01,1,1,1,1,1,1,1,1.1,1.15,1.2,1.3,1.330416,1.483599,1.5,1.5,1.5)
	NR_RealTravSpeed	Dimensionless	INTSPLINE (2,0,0.05,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.5,0.7,0.7,0.8,0.85,0.9,0.9,0.9,0.95,1,1.2,1.2,1.25,1.25,1.3,1.3,1.3,1.3,1.3,1.3,1.3)
	Pot_LevelService	Dimensionless	INTSPLINE (2,0,0.01,70,70,67,60,57,55,50,48,36,30,25,25,25,25,25)
	Real_LevelServic	Dimensionless	INTSPLINE (2,0,0.01,70,70,67,60,57,55,50,48,36,30,25,25,25,25,25)
Delays	Delay_1	Years	RETARDO (RoadsInvestment,10,5,1)
	Delay_2	Years	RETARDO (Attract_Car_Use,1,1,0)

at how actual road conditions evolve; instead, motorized travel is considered to be induced if it is shown that there is more travel demand occurring when new roads are built (Gorham, 2009). In addition, the simulation scenarios do not seek to match a set of accurate outputs; instead, they allow validating in the way that the feedback structure reproduces ITD behaviors that are reported in econometric literature.

The road congestion index (RCI) can be seen in Figure 5. Its behavior shows the state of mobility through a time horizon of 15 years in axis X. Axis Y is the ratio between kilometers traveled by cars and kilometers built. The road construction scenario at the beginning of the time horizon has high RCI values because of the time delay required to finish the construction of new roads (blue curve). Then, the RCI starts to decrease until values near 0.1. The expected results of building roads become evident between 2018 and 2022. However, the unintended consequences of new roads appear after that time interval. Higher travel speeds increase attractiveness of car use, and mobility tends to be congested again. For the not construction scenario, RCI values always tend to increase because there is not enough space to supply the demanded capacity by the normal fleet growth (red curve), which can be influenced either by economic or social elements that are not considered in the proposed model.

These results in both scenarios come from the feedback loop named "Intuitive Building Policy", which is shown in Figure 6. This loop reflects the traditional decision-making process wherein building roads can keep ahead of traffic congestion. However, such policy only releases mobility temporarily (Figure 5). In a long-term time horizon, congestion appears again with equal or worse values than its previous state.

The reference mode on the left side of Figure 7 shows how building new roads generates new traffic. This behavior can be explained through the feedback loop in Figure 8 wherein road construction improves potential travel speed and increases the attractiveness of car use. This feedback loop produces the blue curve behavior that was observed for the road construction scenario in the graph on right side of Figure 7. For the not construction scenario (red curve) in Figure 7, the attractiveness of car use is not influenced by potential travel speed improvements; therefore, the car use curve for this scenario has lower values than the blue curve.

The new traffic that is generated by road construction implies that there will be more cars on roads, and therefore, more kilometers will be traveled, which can be seen in Figure 9 (red curve). However, it is important to notice that the total kilometers traveled start to increase before the year 2020 before potential travel speed generates new traffic after 2020 (blue curve on the right side of Figure 7). This happens because new roads improve real travel speed at which cars already in use are traveling. Consequently, higher travel speeds induce people to travel more kilometers, which can be structurally explained in the "Induced Travel Demand" loop of Figure 10. For the case of the not road construction scenario in Figure 9 (blue curve), the increase of kilometers traveled is lower than the red curve. There are two reasons that can justify this behavior. First, without new roads, mobility remains congested, and there is no high real travel speed that can induce cars that are already in use to travel more kilometers. Second, without road construction, there is no potential travel speed that generates new traffic.

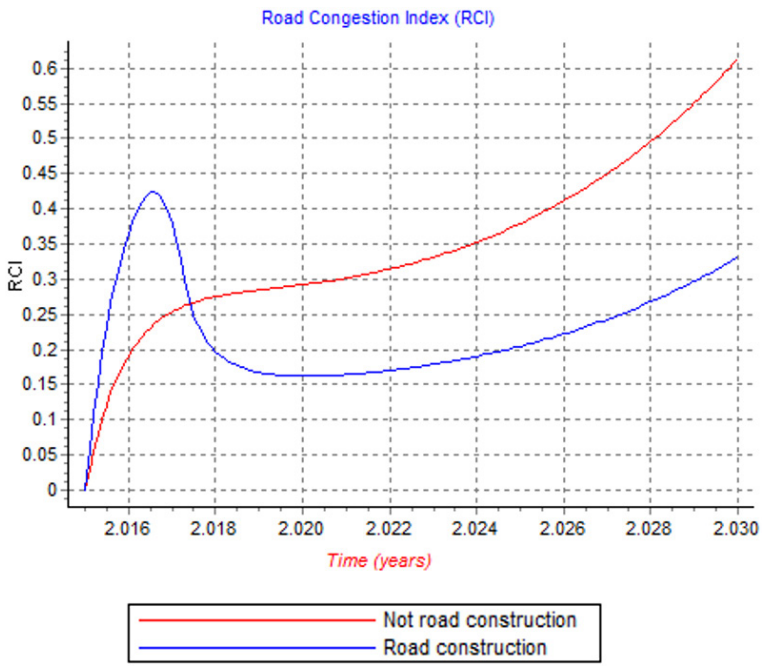

Figure 5. Road congestion index generated by "Intuitive Building Policy" balancing loop

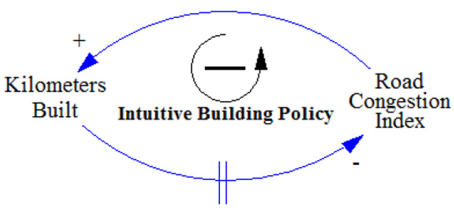

Figure 6. "Intuitive Building policy" balancing loop

Finally, Figure 11 shows the real travel speed behavior for the road construction scenario and the not construction scenario. In the first scenario, travel speed has lower values at the beginning of the time horizon when the RCI is higher (Figure 5). When the time delay of building new roads has finished, the real travel speed enhances car use. Nevertheless, at the end of the time horizon, the travel speed decreases because car use saturates roads' capacity again. In the case of the not road construction scenario (red curve), travel speed values are lower than the blue curve because without new roads the normal fleet growth congests mobility rapidly. This behavior can be explained by means of the causal loop shown in Figure 12, which depicts how travel speed is absorbed by car use. Such car use is composed of induced travel demand and generated traffic.

5 Discussion

Questions about causal links between traffic and road construction require a look beyond the statistical relationship of kilometers traveled and kilometers built. The ITD phenomenon has already been measured and corroborated but not structurally explained at all. Causality is not the main purpose of econometric models (Concas, 2013). However, some authors have dealt with causality through the Granger test and instrumental variables in least squares of two and three stages (Cervero and Hansen, 2002; Cervero and Hansen, 2000; Hymel et al., 2010; Melo et al., 2012; Noland and Cowart, 2000; Özuysal et al., 2008). Although these techniques deal with causality, it is necessary to gain more insight into the structural complexity of ITD to improve policy design to address this phenomenon. System dynamics offers to explain such complexity with feedback loops, non-linear relationships and delays that represent lag responses of people with respect to flow improvements of new roads. These modeling tools fit better with ITD if it

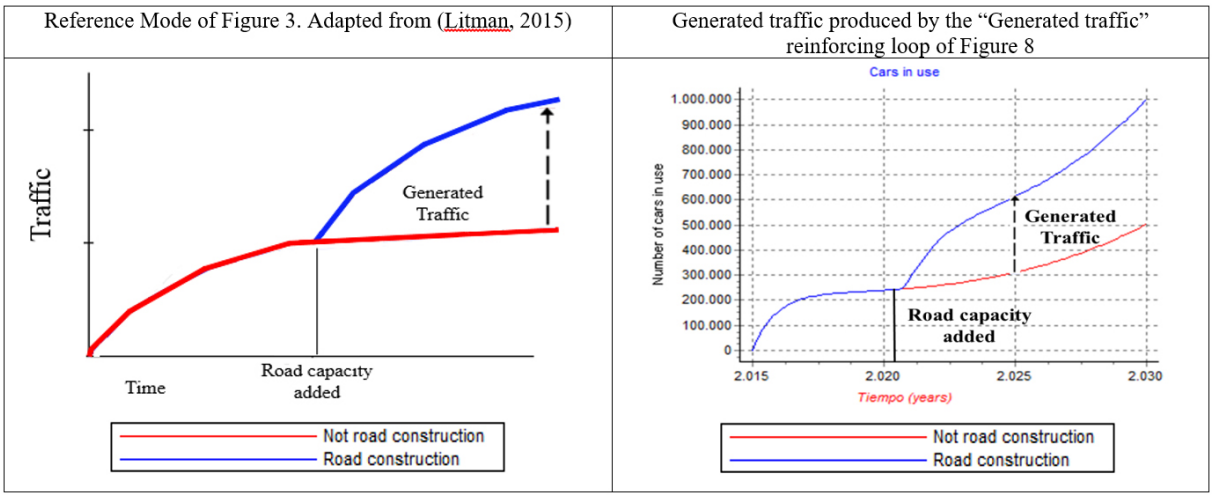

Figure 7: Reference mode and "Generated traffic" loop behavior

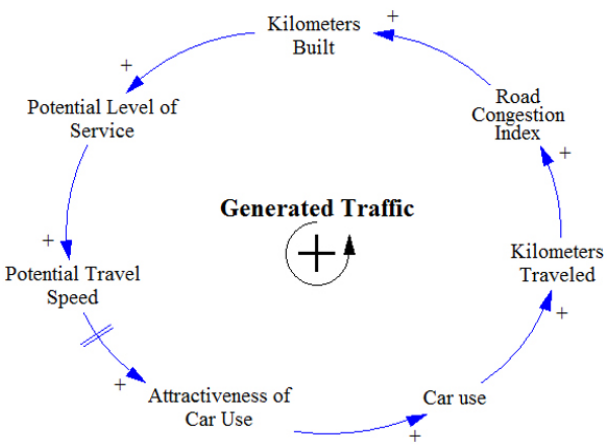

Figure 8: "Generated traffic" reinforcing loop

is assumed to be a social phenomenon that involves people's behavior and the way in which they travel.

Based on the evidence provided by econometric works, it is possible to propose a systemic representation of ITD. Simulation results that come from the feedback structure of the system dynamics model that was built show two ITD behaviors. In the short term, cars already in use travel more kilometers. This short-term ITD refers to conscious decisions made by drivers to take advantage of flow condition improvements created by new roads, which the "induced travel demand" loop shows in Figure 10. Some authors classify this type of ITD as direct induced travel demand (Gorham, 2009). Several studies have used elasticities to quantify the increments of kilometers traveled, which are induced by road construction. Elasticity measures usually range from 0.3 to 0.6, depending on the urban context studied (Concas, 2013; Handy, 2014; He and Zhao, 2014; Litman, 2015; Shengchuan; 2012).

In addition, the simulation results depict a medium-term ITD that matches with the reference mode in section 4.3. Duranton and Turner (2011), in their work named "the law of road congestion", argue that building roads can create new travelers. These new travelers are the generated traffic produced by the "Generated Traffic" loop when travel speed, one engine of car use growth (Bleijenberg, 2012), increases attractiveness of car use. Consequently, more cars are going to travel on new roads, which, when added to vehicles already in use, saturate mobility again in a long-term time horizon, which is shown in the road congestion index of Figure 5. Gorhman (2009) classifies this type of ITD as indirect induced travel demand, which has statistically been measured through elasticities that mostly fall into the range from 0.6 to 1.0 (Cervero and Hansen, 2002; Duranton and Turner, 2011; He and Zhao, 2014; Noland, 2001; Noland and Cowart, 2000).

It is clear that econometric models based on elasticities

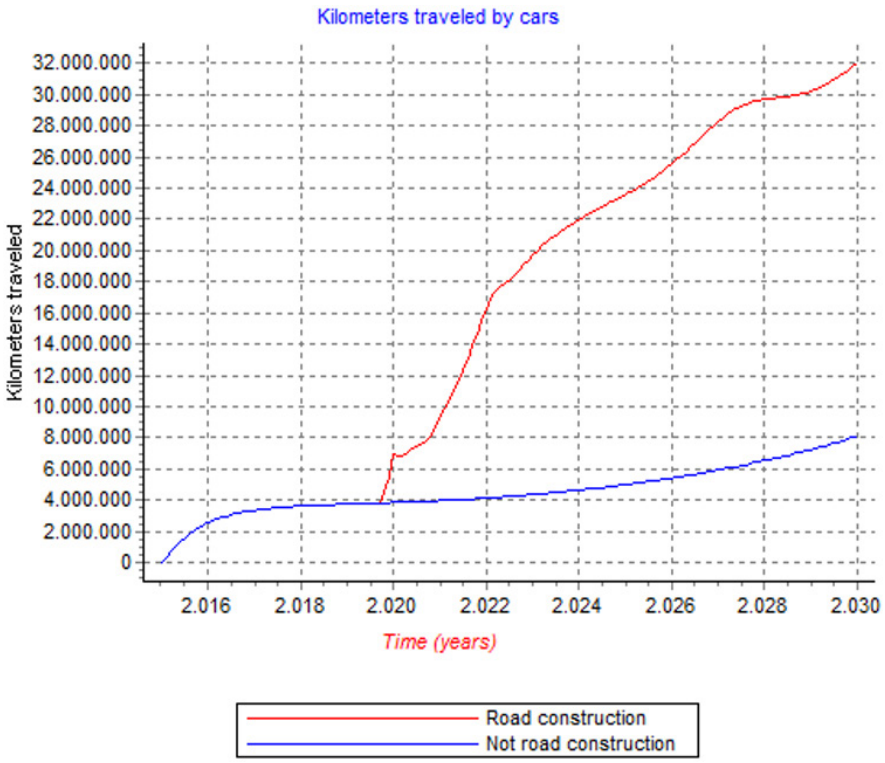

Figure 9: Kilometers traveled generated by the "Induced Travel Demand" reinforcing loop

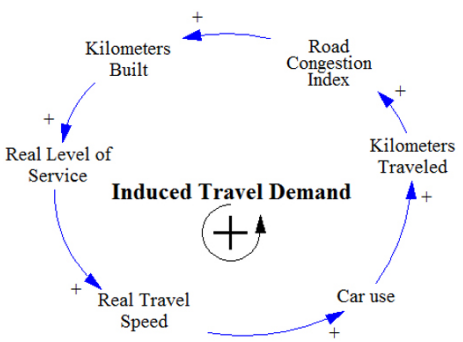

Figure 10: "Induced Travel Demand" reinforcing loop

show how responsive travel demand is to road construction. Such estimations corroborate the existence of ITD at a microeconomic level and the way in which it increases trip-making. Nevertheless, ITD does not refer to people making more frequent trips; instead, the term refers to the overall amount of motorized travel undertaken because of new roads creation (Gorham, 2009). In this sense, the system dynamics model that we proposed complements previous literature results because the ITD behaviors described above emerge at an aggregate level, motorized travel as a whole instead of focusing on quantifying discrete trip increases after road construction as econometric models have done until now. Model simulations do not seek to accomplish a level of accuracy in their results; instead, their feedback structure clarifies the structural complexity underlying the results that are obtained with elasticities in other works. In this context, the model built can be conceived as a structural explanation of ITD based on one premise of the systems dynamics paradigm: similar structures correspond to similar behaviors (Andrade et al., 2001; Forrester, 1971).

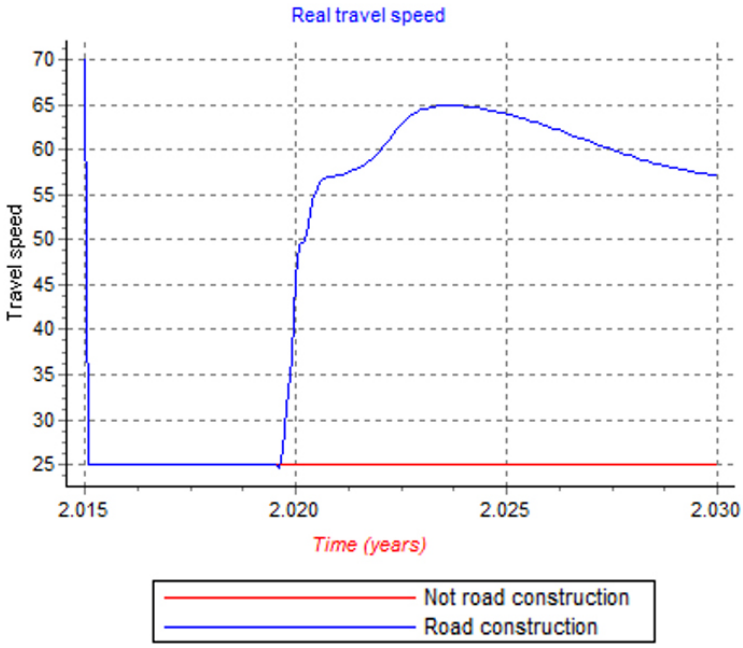

Figure 11: Real travel speed behavior generated by the "Travel Speed Decreasing" balancing loop

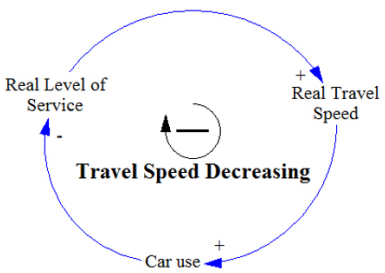

Figure 12: "Travel Speed Decreasing" balancing loop

6 Conclusions

Approaching induced travel demand (ITD) with a systemic perspective allows us to identify leverage points that contribute to comprehensive design policies aimed to cope with this phenomenon. The main contribution of this work lies in obtaining a fundamental understanding of the structural complexity underlying ITD. Understanding such complexity is valuable when unintended consequences of road construction are unknown, and though road construction in developed countries is no longer an exclusive policy to reduce congestion, in many developing countries, rapid urban sprawl, high population growth, raised motorization rates and traffic congestion have promoted a perceived need for more roads, which would enhance car use among transport policy-makers.

Although the more general concept of induced travel applies to the entire transportation sector, not just to one mode, motorized travel demand supplied with new roads needs special attention because of the economic, social and environmental consequences of both road construction and intensive car use. Policy-makers in developing countries could argue that road construction is a policy that at least can keep ahead of growing traffic congestion. Nevertheless, based on simulation results it is possible to state that a transport conception that depends mainly on private vehicles as the predominant means of transport is condemned to be trapped inside traffic congestion. Regardless of how much road capacity strategic planning provides, higher travel speeds coming from new roads are absorbed by ITD in a short- and medium-term time horizon.

To escape from such transport conception requires creating a new and sustainable transport conception that goes beyond the old transport planning paradigm in which road construction seeks to improve mobility, maximizing motor vehicle travel speeds and affordability. Although the feedback structure that is proposed in this paper is a structural explanation of ITD, the structure's center is based on

cars and travel speed as measures of travel performance. Therefore, future work must focus on moving the structure's center from private vehicles to people. This allows for a conversation about accessibility for people rather than mobility attached to cars traveling at high speeds. In addition, the model boundaries should be expanded to consider alternative strategies beyond road construction to address traffic congestion and ITD within developing urban contexts wherein road construction is still necessary to guarantee connectivity.

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Analiza strukturne kompleksnosti povpraševanja po povzročenih potovanjih pri odločanju: pristop sistemske dinamike

Ozadje in namen: Povpraševanje po povzročenih potovanjih (ang: induced travel demand, ITD) je pojav, kjer se izgradnjo cest povečuje prevoženih kilometrov na vozilo. ITD navadno analizirajo z ekonometričnimi modeli, ki uporabljajo elastičnost za oceno koliko povpraševanja po povzročenih potovanjih lahko povzroči gradnja novih cest. V literaturi ne najdemo modelov »bele škratlje« z vzročno hipotezo, ki bi pojasnjevali strukturno kompleksnost tega pojava. V članku predlagamo model sistemske dinamike, ki temelji na mehanizmu povratne informacije, da pojasni strukturo ITD.
Metodologija: Za modeliranje in simulacijo ITD smo uporabili metodologijo sistemske dinamike. Najprej smo izdelali diagram strukture ITD v smislu povratnih zank. Nato smo oblikovali diagram zalog in tokov, da smo lahko uporabili računalniško simulacijo. Na koncu smo izvedli simulacijo kvantitativno časovnega razvoja modela.
Rezultati: Rezultati simulacije kažejo, kako nove ceste v kratkem času povzročajo več prevoženih kilometrov pri vozilih, ki so že v uporabi; v srednjeročnem obdobju pa povzročijo nastanek novega prometa. Pojavljajo se novi vozniki avtomobilov se pojavijo, ker boljši pogoji pretoka zaradi novih cest povečajo privlačnost uporabe avtomobila. Več novih avtomobilov skupaj z vozili, ki so že v uporabi, povzročijo prometne zastoje. Povečana hitrost potovanja, ki jo omogočajo zgrajene ceste, je omejena zaradi ITD učinkov.
Zaključek: Pristop k analizi ITD s sistemskega vidika sistemskega omogoča ugotavljate finančno ravnovesje in prispeva k oblikovanju celovite politike obvladovanja ITD. V tem smislu je model podpira procese odločanja v urbanih okoljih, kjer se odloča o gradnji cest z namenom, da se zagotovi povezljivost znotraj države, na primer v državah v razvoju.

Ključne besede: *povpraševanje po povzročenih potovanjih; sistemska dinamika; odločanje; dinamično modeliranje*

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A Primary Human Critical Success Factors Model for the ERP System Implementation

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Background and Purpose: Many researchers have investigated various Critical success factors (CSFs) and the different causes of ERP implementation project failures. Despite a detailed literature preview, we were unable to find an appropriate research with a comprehensive overview of the true causes behind CSFs, observed from a human factors perspective. The objective of this research was therefore to develop and evaluate the Primary human factors (PHFs) model and to confirm the significant impact of PHFs on traditional CSFs and on the project success.
Design/Methodology/Approach: The comprehensive PHFs research model was developed and examined in empirical quantitative research with the use of available literature and the application of the Root cause analysis. A survey was conducted in various Slovenian organisations in different branches that had previously implemented the ERP system SAP. The model was verified on a sample of 21 experts from 18 organisations.
Results: The results show that the PHFs have a significant positive impact on the ERP implementation project success, but only the Competence and Team composition factors are significant linear predictors in an adapted regression model and contribute significantly in predicting project success. These results therefore confirm both proposed hypotheses and the adapted regression model.
Conclusion: This study improves the understanding of PHFs and confirms that they have a significant impact on traditional CSFs and the ERP implementation project success. The proposed PHFs model offers project managers and other stakeholders an effective risk assessment of CSFs and is leading the way to human oriented model of ERP implementations.

Keywords: *ERP implementation project, Critical success factors, Primary human factors model*

1 Introduction

Over the last few decades, ERP systems have become an indispensable IT solution for all types of businesses and enterprises. ERP are business applications that integrate all the associated functional areas, business processes, and data within an organization. ERP solutions establish one central database, one integrated application, and one common graphical user interface that manages all its information and transactions. ERP allows different departments with diverse needs to communicate with each other by sharing the same information in a single system. ERP thus increases cooperation and interaction between all business units in an organization (Harrison, 2004).

Despite the many benefits the ERP systems provide if properly implemented, there are also many weaknesses, especially at the implementation process itself; this is why a successful implementation and use of the ERP is particularly important. Projects of ERP implementation are known for their complexity; they usually have a long implementation cycle and are consequently subjected to high risk. They use industry specific business processes, unite a variety of stakeholders and involve various participants

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with different knowledge, skills, and experience. Because of all these reasons, the success of an ERP implementation project is unpredictable. According to AMR (2015) and Standish Group (2013) and taking into account a standard triangle measure of project success, deadlines, budget and scope, only 39% of the projects are successfully finished, 43% are partly successful, and 18% are unsuccessful. The trend of successful projects has been positive in last years, but still insufficient as to what should be expected. Consequently, there has been a great interest in the ERP implementation area with numerous authors researching the causes and consequences of implementation failures from the early 1990's on. Such an interest is not surprising considering the growing importance of success in a company's most essential projects, with its high investment and organisational risks. Researchers in the past have introduced different CSFs and observed their interconnections, studied the causes and consequences, proposed actions, and used various risk management methods to improve people's perception and actions in order to increase the level of future implementations. In the last decade, the interest has focused mostly on the human group of CSFs and many researchers confirmed the strong impact of many human CSFs towards the implementation project success.

Interestingly, although the failure rate of the ERP implementations has been highly publicized, companies have not been distracted from investing large sums of money in new ERP systems as they have become something of a business standard and a must-have. What is alarming on the other hand is the fact that companies obviously still do not put much effort nor invest extra time and attention to change the course of the implementation by following the best practices and recommendations from referential case studies in available literature. In doing so, the results would be evident in improve success rates. One of the objective reasons is definitely a well-established business routine approach and a lack of an efficient model to access and address the truly important risk factors. The critical success factors are defined by Rockart (1979) as: Those few critical areas where things must go right for the business to flourish. The problem emerges when those few areas become "too many" and when we suddenly have more than 90 various CSFs, which are impossible to cope with. There are also many causal factors behind CSFs which these general factors are not addressing and yet they are critical and have the important influence on CSFs and achieving project success. Ram and Corkindale (2014) have come to the conclusion that merely identifying possible CSFs in not sufficient to help with ERP success. Williams and Ramaprasad (1996) also noted that, although CSFs are widely used by academic researchers and practitioners, it is important to distinguish between different levels of criticality. They suggested four types of criticality in a descending order of power: factors linked to success by a known causal mechanism, factors necessary and sufficient for success, factors necessary for success, and factors associated with success. A causal link between a factor and an outcome is therefore empirically and logically stronger than a mere association.

All the previously mentioned facts, especially the uncertain implementation results and the lack of a simple, yet comprehensive model to address the true causes behind CSFs were therefore the most important motivating factors for this research. The key research questions of this study were: Are the human factors truly the most important group of CSFs and if so, which primary human factors can be linked in a comprehensive research model to completely cover the causal influence on traditional CSFs? With the intention to answer these key research questions, the main objectives of research were: identification of the primary human factors, development of a comprehensive research model, and confirmation of the research model through an empirical analysis.

2 Methods

2.1 Methodology

The research was conducted in the following stages: In the first stage, we reviewed the relevant scientific literature and resources; in the second stage, we formed a research model with the analytical method of the Root cause analysis by exploring the true causes behind CSFs and taking into account the literature findings and recommendations. The model was developed to examine the influence of PHFs on CSFs and project success. In the third stage, the quantitative research approach was chosen, and a survey questionnaire was developed based on the proposed model. We submitted the online questionnaire to three participants to review it, in order to avoid any ambiguity in understanding and completing the survey. As the positive responses proved the questionnaire was adequate, the invitation was sent to other participants, selected from the company's database, considering their experience and position within the ERP implementation project. In the final stage, the available data was collected, statistically analysed, and the results were interpreted.

2.2 Literature review

Critical success factor (CSF) is a management term for an element that is necessary for an organization or project to achieve its mission. It is a critical factor or activity required for ensuring success (Rockart, 1979). The term was initially used in the world of data and business analysis by Ronald Daniel and refined into critical success factors by John F. Rockart.

Authors addressed a wide range of CSFs in the past few years, the factors were mostly reused with identical

names, sometimes with a different description but similar connotation and occasionally authors suggested some new ones. According to Shaul and Tauber (2013) who conducted a careful examination of the majority of the articles from the beginning of millennium, various authors suggested a total of 94 CSFs in ERP implementations. Tarhini et al. (2015) identified 51 CSFs and classified them according to a stakeholders group. The most listed and quoted CSFs in the past ten years according to several researchers, (Huang, 2010; Shaul and Tauber, 2013; Tarhini et al., 2015; Shirouyehzad et al.,2011; Ngai et al.,2008; Somers and Nelson, 2001) who made a comprehensive review of the CSFs used in the research articles are enclosed in Table 1.

Some authors (Gupta et al., 2014; Ziemba and Oblak, 2013; Nasir and Sahibuddin, 2011; Huang, 2010) classified CSFs into 3 main groups: human (people-related), organisational (process- and company-related), and technical (software technology- and IT system-related) factor groups.

Huang (2010) concluded that researchers pay more attention to human factors than to technical factors in an ERP implementation as more articles promote end-user training and involvement as a critical factor over technical skills or IT infrastructure. With the development of ERP software, it has become more mature and requires less attention to technical issues. Also, the communication among managers, end-users, ERP vendors, and project team members has become more important than before as it was found that an open and honest communication plays a vital role in ERP implementation. Many authors also emphasize the importance of knowledge and skills in a knowledge-intense project such as an ERP implementation.

Over 60 research articles addressing solely human critical success factors (HCSFs) were therefore carefully examined to get a deeper insight. The addressed HCSFs were: *Competence* (Charland et al., 2015; Massini and Wassenhove, 2009; Santos Rodriguez and Dorrego, 2008), *Knowledge transfer* (Goyette et al., 2014; Lech, 2011, Xu and Ma, 2008, Wang et al., 2007), *Tacit knowledge sharing* (Irick, 2007; Sun, 2007; Vandaie, 2008; Scorta, 2008), *Knowledge management and education* (O'Leary, 2002; Mohamed and McLaren, 2009), *Communication* (Aubert et al., 2013; Wang and Chen, 2006), *Motivation* (Walsh and Schneider, 2002; Yatsuzuka et al., 2009), *Team composition and transformation* (Yeh and Chou, 2005; Hamani et al., 2012; Lui and Chan, 2008), *Organizational and team learning cycle* (Akkermans and Helden, 2002; Bologa and Lupu, 2014; Akgun et al., 2014), *Team resilience* (Amaral et al., 2015), *Problem solving competence* (Lin et al., 2015, Li et al., 2010), *Conflict resolution* (Wang and Chen, 2006; Chou and Yeh, 2007), *Relationship bonding* (Hung et al., 2012), *Spiral continuous improvement* (McGinnis and Huang, 2007; Scorta, 2008), *Cognitive learning* (Cronan et al., 2012), Collective intelligence (Yuan et al., 2007), *Knowledge withholding intentions and social cognition* (Tsay et al., 2014), *Group cohesiveness and normative conformity* (Tsay et al., 2014), and *Personal interest in Agency theory* (Walsh and Schneider, 2002).

An overview analysis of the addressed topics revealed that beside individual human factors, researchers were mostly focused on team characteristics, which highlights the importance of an excellent team for achieving project success. Group development and Group dynamics address this field from a theoretical perspective and are supported a large number of theoretical models and different theories.

After the examination of many research articles, the number of CSFs and HCSFs rapidly increased, as it became evident that a large number of factors does not simplify their management and this is not a transparent and straightforward solution. Many researchers namely confirmed the influence of many factors on project success and addressed these factors in detail in order to successfully manage them and solve the possible issues. But actually, treating CSFs from a top level is only a part of solving the entire problem, as it is evident that this problem is more complex and multi-layered. We require a comprehensive solution to cover all the underlying causes in a much wider context. While searching for some existing or related procedures to address causal structure in the available literature, only a few authors (Akkermans and Helden, 2002; Gandhi, 2015) addressed the causal aspect of CSFs and were researching the interdependence (causes and consequences) between critical factors and sub-factors, but only for selected CSFs and with a limited perspective.

2.3 The development of the research model

In order to develop the research model, we used the following steps:

First, the CSFs were grouped into three main factor groups: Human, Organisational, and Technical. Since there was no available explanation to be found in the literature to suggest how to logically group different CSFs, we merged them according to their relation to the human activities and those related to the system, which represents a much wider concept. Every single system is in fact conceived by human ingenuity and activities which are already embedded in the system and therefore cannot be influenced by human factors during the implementation project. Using this logic, the system-related factors were sorted further in two groups. The first group representing a system is the organisation, the other is the technical or information technology platform. We evaluated the meaning and connection of every single CSF and estimated the possible interrelated impact of other groups. The grouping was also checked with the other authors quoted in the previous chapter.

In the second step, we analysed CSFs using the Root cause analysis. The purpose of this specific technique is

Table 1: The most listed and quoted CSFs in the past ten years

Primary human factors	**Authors**
COMPETENCE	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shirouyehzad et al. (2011), Shaul and Tauber (2013), Candra (2012), Charland et al. (2015), Massini and Wassenhove (2009)
BEHAVIOUR	Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013), Walsh and Schneider (2002), Yatsuzuka et al. (2009)
COMMUNICATION	Tarhini et al. (2015), Ngai et al. (2008), Shirouyehzad et al. (2011), Shaul and Tauber (2013), Huang (2010), Wang (2006), Aubert et al. (2013)
TEAM COMPOSITION	Tarhini et al. (2015), Ngai et al. (2008), Shirouyehzad et al. (2011), Yeh and Chou (2005), Hamani et al. (2012), Lui and Chan (2008)
Human CSFs	
Project team capability and team work	Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Huang (2010)
Knowledge transfer/management	Ngai et al. (2008), Shaul and Tauber (2013), Goyette et al. (2014), Lech (2011), Xu and Ma (2008), Sun (2007), Vandaie (2008), Scorta (2008), O'Leary (2002)
Learning cycle (team and organisation)	Akkermans and Helden (2002), Bologa and Lupu (2014), Akgun et al. (2014)
Spiral continuous improvement	McGinnis and Huang (2007), Scorta (2008)
Top management support and commitment	Somers and Nelson (2001), Tarhini et al. (2015), Shirouyehzad et al. (2011), Huang (2010)
Clear goals and objectives	Somers and Nelson (2001), Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Huang (2010)
Interdepartmental cooperation/conflicts	Somers and Nelson (2001), Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013)
Interdepartmental communication	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
ERP implementation project management	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013), Huang (2010)
Management of expectations	Somers and Nelson (2001), Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013)
Adequate ERP package and consultant company selection	Somers and Nelson (2001), Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013), Huang (2010)
Adequate project constraints planning	Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013), Huang (2010)
End user involvement/support	Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013)
Adequate end user training	Somers and Nelson (2001), Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013), Huang (2010)
Adequate education on new business processes	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013), Huang (2010)
ERP implementation quality management	Ngai et al. (2008), Shaul and Tauber (2013)
ERP implementation risk management	Shaul and Tauber (2013)
Adequate human resources	Tarhini et al. (2015), Shirouyehzad et al. (2011)
Recruit and retain human resources	Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013)

Table 1: The most listed and quoted CSFs in the past ten years (continued)

Empowered decision makers	Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
Reducing the user's resistance	Tarhini et al. (2015)
Focus on user requirements	Tarhini et al. (2015), Shaul and Tauber (2013)
Unclear development requirements	Shirouyehzad et al. (2011)
Capable project manager	Tarhini et al. (2015)
Senior project champion	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013), Huang (2010)
Professional steering committee	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
Minimal customization decision	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
Use of consultants decision	Somers and Nelson (2001), Tarhini et al. (2015), Shaul and Tauber (2013)
Political structure/conflicts	Shaul and Tauber (2013)
National culture	Ngai et al. (2008)
Organisational CSFs	
Organizational culture	Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
Team members availability	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
Sufficient human resources	Shirouyehzad et al. (2011), Ngai et al. (2008)
Formalised /effective project methodology	Tarhini et al. (2015), Shirouyehzad et al. (2011)
Formalised project plan/schedule	Tarhini et al. (2015), Shaul and Tauber (2013)
Organisational fit for ERP system (structure and processes)	Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013)
Alignment between business and IT strategies	Shaul and Tauber (2013)
Adequate process of change management/commitment	Somers and Nelson (2001), Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Shaul and Tauber (2013), Huang (2010)
Adequate business process redesign	Somers and Nelson (2001), Tarhini et al. (2015), Shirouyehzad et al. (2011), Ngai et al. (2008), Huang (2010)
Integration of business planning with ERP planning	Tarhini et al. (2015)
Vendor/Consultant/Customer partnership	Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
Vendor support	Somers and Nelson (2001), Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
Technical CSFs	
IT infrastructure/stability	Tarhini et al. (2015), Shirouyehzad et al. (2011)
ERP architecture and quality	Somers and Nelson (2001), Ngai et al. (2008), Shaul and Tauber (2013)
ERP advanced technology	Shirouyehzad et al. (2011), Shaul and Tauber (2013)
ERP implementation strategy	Ngai et al. (2008), Shaul and Tauber (2013)
Data analysis and conversion	Somers and Nelson (2001), Ngai et al. (2008), Shaul and Tauber (2013)
Data and information quality	Tarhini et al. (2015), Ngai et al. (2008), Shaul and Tauber (2013)
Suitable IT legacy systems	Tarhini et al. (2015)
Integration between enterprise wide-systems	Shirouyehzad et al. (2011)
Software management methodology	Shirouyehzad et al. (2011)
Use of vendor's tools	Somers and Nelson (2001), Ngai et al. (2008), Shaul and Tauber (2013)
Ease of system's use	Tarhini et al. (2015)

to identify a problem, discover the underlying causes that lead to it, and develop preventive action (PMI, 2013). This analysis can therefore be used to analyse CSFs and find the root cause factors that possibly influence the main factors. A root cause is the main source of a problem and if removed, it will prevent the primary effect from occurring. A contributory cause contributes to the severity of the primary effect, but if removed will not prevent the primary effect from occurring (Young, 2008). The behaviour of a complex system emerges from its causal structure. This can only be understood by modelling a problem's essential causal structure, which must include the root causes, whereas the problem is too complex to solve without first decomposing it into sub-problems.

We therefore decomposed the SCFs into sub-factors (causes) using a cause and effect diagram and then aggregated the identified causes into logical groups, which we named according to their content, to form the Primary human factors (PHFs). PHFs obviously have many sub-factors on a lower level, another set of independent variables that influence them. Therefore, four influential elements were identified as PHFs: Competence, Behaviour, Communication, and Team Composition. The first two factors can be primarily connected to a personal and the last two to a group (interpersonal) characteristic. The first two factors can secondarily also be connected to a group characteristic. PHFs represent soft factors that affect each other in a reinforcing manner and have an important influence on conventional hard factors (CSFs). We composed a two-level PHFs model with multiple variables obtained from the exploratory literature research. The model structure can be seen in Table 2.

Due to its complexity, we decided to leave it only as a proposition for a subsequent research, so the basic PHFs research model was chosen to represent the PHFs' interconnection and their influence on CSFs.

We can also conceptually check the proposed research model from one important aspect of the ERP implementation. It is known that the core process in ERP implementation that drives the project's progress is the ERP system software development process, which includes configuring and customizing the software package to the customers' needs and demands and is driven by the work groups of the key users, ERP consultants, and developers in the wider project team. It is clear that individuals have to cooperate within a group because of the projects' nature. The main parameters of a successful development process are an excellent individual competence of the participants and an effective and open communication between the participants that depends on good interpersonal relations, which again depends on a suitable team composition and behaviour of individuals. This illustration of the causal structure illustrates the long chain of dependent influences of PHFs that impact process effectiveness and ultimately its suc-

Table 2: The proposed two-levelled Primary human CSFs model

COMPETENCE	BEHAVIOUR	TEAM COMPOSITION	COMMUNICATION
Knowledge	Motivation	Interaction	Open and honest
Skills	Trust	Involvement	Efficient
Experience	Leadership	Cooperation	
Capability	Reliability	Efficiency	
Efficiency	Responsibility	Resilience	
	Perseverance	Conflict resolution	
	Initiative	Relationship bonding	
	Devotion	Collective intelligence	
	Empathy	Cohesiveness	
	Expectation	Group Conformity	
	Satisfaction		
	Normative conformity		
	Social cognition		
	Risk propensity		
	Conflict propensity		
	Partiality (bias)		
	Personal interest		
	Ability to establish relations		
	Willingness to work in a team		
	Knowledge concealing		

Figure 1: The primary human CSFs research model

cess. Akkermans and Helden (2002) also noted that ERP systems are meant to integrate different business functions and different organisational departments, so it is logical that communication and collaboration across the project team members from different departments are at the core of the implementation process. These two factors not only go hand in hand but they also seem to reinforce each other. As one goes up and the quality of collaboration increases, the other will increase as a result as well. People that work together more often communicate more often. Vice versa, better communication will lead to better collaboration. This is what system dynamics terms call a reinforcing loop. Left to its own, this loop will either continue to increase in an upward spiral of ever-higher performance, or become caught in a never-ending downward spiral of ever-lower performance.

All the previously mentioned characteristics are addressed in a concept named High-performance teams within organization development theory. A high-performance team can be defined as a group of people with specific roles and complementary talents and skills, aligned with and committed to a common purpose, who consistently show high levels of collaboration and innovation that produces superior results. The high-performance team is focused on their goal and have supportive processes that will enable any team member to surmount any barriers in achieving the team's goals. Therefore it outperforms all other similar teams and also expectations given to their composition (Bard, 2015).

Hereafter we reveal the characteristics of PHFs and the related sub-factors.

Competence

Competence is by definition the ability to do something successfully or efficiently (Oxford Dictionaries, 2016). It is a cluster of related abilities that enable an individual or an organisation to act effectively in a job or situation. Competence indicates a sufficiency of knowledge, skills, and experience that enable someone to act in a wide variety of situations (Business dictionary, 2016).

In the context of ERP implementation success, knowledge has been suggested as its critical factor by many authors (Sedera and Gable, 2010; Deng and Bian, 2007; Gable et al., 1998; Grant, 1996). Managing an ERP System is a knowledge intensive task that necessarily draws upon the experience and involvement of a wide range of stakeholders with diverse knowledge capabilities. Building on a resource-based view of the firm, the knowledge based theory of the firm considers knowledge as unique, the most strategically significant resource by focusing on knowledge (Grant, 1996). It has become a very important concept in the business world in the last decade. Knowledge is acquired with the process of theoretical learning and systematic study. Polanyi (1962) classifies knowledge into two categories: explicit and tacit knowledge. Explicit knowledge can be codified and shared in the form of hard data, manuals, codified procedures or universal principles, while tacit knowledge results from an individual's experience and is only revealed through its application. Spender (1996) proposes that knowledge can be held by individuals or collectively. Collective knowledge comes from knowledge integration: it is the combination of the coordinated efforts of several individuals who hold different but complementary skills (Grant, 1996). Knowledge capability is the systematic process of understanding, assimilating, and applying an organization to make the best use of knowledge to achieve a sustainable competitive advantage and high performance. Knowledge capability provides an opportunity for achieving substantial savings, significant improvements in human performance, and enhanced competitiveness. Knowledge capability is multidisciplinary by nature and integrates concepts used in strategic management, organization theory, and information systems management (Candra, 2012).

Experience is familiarity with a skill or field of knowledge acquired over months or years of actual practice and which, presumably, has resulted in a superior understanding or mastery (Business dictionary, 2016). Experience is acquired with the process of practical learning. A person with considerable experience in a specific field can gain a reputation as an expert. Learning, knowledge and experience are important on a personal and organisational level. Organisational learning is the process of creating, retaining, and transferring knowledge within an organisation, which improves over time as it gains experience and from

this experience it is able to create new knowledge. Knowledge is created at four different units, individual, group, organisational, and inter-organizational (Argote, 2013). To get a quick insight of the competence needed for different roles (Key users, Project manager, IT and general management personnel, External consultants, developers, system engineers), lists of knowledge and skills were drafted from the available literature. The lists show the complexity and wide array of the required expertise to successfully manage the knowledge intensive software development project of an ERP implementation.

Knowledge list: Strategic, Requirements, ERP evaluation and selection, Project management, Business processes knowledge, Change management, Crisis management, Time management, Knowledge management, Technology management, Risk management, Stress management, ERP technical knowledge, Solution designing knowledge, Evaluating knowledge, and Continuous improvement knowledge (Zhong et al., 2007).

Skill list: Personal, Team, System, Organizing, Decision making, Problem solving, Strategic planning, Analytical, Communication, Leadership, General, Information literacy, Conflict solving, Negotiation, Teaching, Training, Programming (Mahdavian and Mostejeran, 2013).

Behaviour

Behaviour is the way one acts or conducts oneself, especially towards others (Oxford Dictionaries, 2016). We distinguish between individual and group behaviour. The behaviour of one individual has a strong impact on the behaviour of other individuals inside a group or organisation. Organisational behaviour is a field of study that investigates the impact that individuals, groups, and a structure have on the behaviour within organisations and it studies many factors that have an impact on how individuals and groups respond to and act in organisations and how organisations manage their environments.

Under this name we therefore have an important group of psychological factors that influence other primary human factors. The main influence factors derived from the quoted HCSFs research articles and behaviour theory are: Motivation (personal and collective), Commitment, Responsibility, Trust, Empathy (understanding the needs of customers and interpersonal in a team), Expectation, Satisfaction (fulfilling personal needs and preferences), Satisficing (typical behaviour of decision makers), Propensity to take risk, Propensity to conflicts, Personal interest (principal-agent or agency theory), Knowledge withholding intentions, and Normal conformity.

Communication

Communication is the imparting or exchanging of information and it is the successful conveying or sharing of ideas and feelings (Oxford Dictionaries, 2016). It is a two-way process of reaching a mutual understanding in which participants not only exchange information, news, ideas, and feelings but also create and share meaning. (Business dictionary, 2016).

Communication is also a competence (skill), but in this context it means efficient exchanging of information to use individual competence at its maximum and to have an effective knowledge sharing, spiral continuous improvement, and a learning cycle. Therefore an open and honest communication and communication effectiveness plays a significant role in implementation projects (Wang and Chen, 2006). Aubert et al. (2013) notes that some research results also show that, for the dimensions of project success that are influenced by communication quality, the form of the communication efforts might be as important and will likely have as much impact as the content of the communication process. The results also specially emphasized the importance of openness in communication.

Team composition

Team composition refers to the overall mix of characteristics among people in a team, which is a unit of two or more individuals who interact interdependently to achieve a common objective (Hackman and Wageman, 2005). It is based on the attributes among the individuals that comprise a team in addition to their main objective. Team composition is usually either homogenous in which all members have similar personal qualities, or heterogeneous in which the team members contain significant differences. It has also been identified as a key factor that influences team performance (Senior and Swailes, 2004). The fashion in which a team is configured has a strong influence on team processes and the outcomes that the team achieves (Bell, 2007). It factors in the individual attributes of the team members (skills, experience, and ability) and how these contributors can potentially combine to dictate the overall performance outcomes for the team (Pieper et al., 2008)

Composing a successful cross-functional team is also an important skill but in this context it is a much wider and important factor so it is exposed individually. An appropriate team composition unites and upgrades the abilities that the individuals hold, so in that manner it has a strong potential influence on the team's performance. The abilities that a good team possesses are: Interaction and Cooperation between individuals, Group cohesiveness and conformity, Social cognition, Relationship bonding, Group resilience, and Conflict management. It influences Knowledge transfer, Spiral Continuous improvement, and Organizational learning cycle. The organizational factors influencing the team outcome are: Availability of team members and personal contact, Retention of experts, and a suitable Organizational culture (Al-Alawi et al., 2007).

Based on the research questions and reviewed literature, the two following hypothesis are eventually offered:

H1: Human critical success factors have the most influence on the implementation project success.

H2: Among the primary human factors, competence has the most influence on the project success.

2.4 Empirical research

To understand the impact of the Primary human factors and to measure their potential influence on success in a real environment and in actual ERP implementations, we conducted a post-implementation empirical research in various Slovenian companies. The research was limited to companies that previously implemented and currently run on an ERP system SAP.

A quantitative approach was chosen to conduct this empirical study as it enables a quick and uniform processing of the research information. A structured survey questionnaire was developed with mostly predefined closed questions. The questionnaire contained 30 questions divided into four groups; participant data, project success, critical success factors, and risk management.

The list of contacts was obtained from an internal company's database with a careful selection of participants, based on the project roles and their experience. The survey was published on a public internet survey portal and a request was emailed to 58 participants (project managers, key users, IT support, and general managers) from 35 large or medium-sized Slovenian organisations, operating in different branches from the public sector, utilities, to the production sector. To obtain a greater number and also more sincere responses, the survey was anonymous. It was successfully completed with 21 responses obtained from 18 different business entities with a 36% response rate. Most respondents were project managers (38%), followed by key users (33%), IT support managers (19%), and general management representatives (10%), in a representative sample, as 91% of participants were professionals with over ten years of experience with ERP systems and implementations. The collected data gave us a pragmatic insight view into ERP implementation projects.

2.5 Methodological tools

To obtain an overview of the linear dependence between the dependent variable—Project success and independent variables—CSFs and PHFs in our research model, the Pearson bivariate correlation coefficients were calculated. A multiple regression analysis was used to test the research hypothesis and research model, , an F-test to verify the statistical significance of the regression model, and a T-test to verify the statistical significances of the regression variables.

3 Results

In the first key measurement, the actual level of the ERP implementation project success was measured with a Likert scale from 1 – very unsuccessful to 5 – very successful with the research statement, "*Evaluate the actual level of success of the ERP implementation with the offered variables*". The objective was to measure different essential variables that define project success in order to observe the different aspects of success. The first three belong to the hard or business-oriented iron triangle, with project success regarding time (deadlines), funds (budget), and scope (functionality). We added some additional, soft or personal-oriented variables from numbers four to six: fulfilment of project goals, general user's expectations, and user's satisfaction. The seventh variable was intended for participants to evaluate the project success in total, by considering all the previously listed variables.

In the statistical analysis of the collected data, the variables were united into three evaluation groups to compare different aspects and verify the evaluation process. The first group represented the classical triangle project success evaluation, which contained the cumulated means of variables 1–3, the second group represented the expanded project success evaluation, which contained the cumulated means of variables 1–6, and the third group represented the participants' overall assessment of the project success,

Table 3: Project success evaluation factors

n=21	*Descriptive statistics*			
Project success	**Mean**	**Std. dev.**	**Min.**	**Max.**
Factor 1 _ V1-V3	3,22	0,745	2	5
Factor 2 _ V1-V6	3,24	0,751	2	5
Factor 3 _ V7	3,33	0,983	2	5

so it contained only variable 7. By comparing the summed mean values of these three factors presented in Table 3, we can see an insignificant difference. This shows the coherence of the participant's evaluation of the implementation project success. Factor 2 was selected for further calculation. In general, the results show a satisfactory implementation project success.

In the second key measurement, the participants were requested to *evaluate the actual level (quality) of the three CSFs groups: Human, Organisational, and Technical group in an ERP implementation project*, which were measured with a Likert scale from 1 – very inappropriate to 5 – very appropriate. The reliability test of the sample data showed that Crombach's Alpha is 0.792, by which the internal consistency was described as acceptable. We calculated the descriptive statistics and the Pearson correlation coefficients; the results are presented in Table 4. We can see that the Human CSFs group is in a strong positive correlation with Project success, followed by Technical and Organisational CSFs groups with a significant correlation. There is also a significant correlation between Human CSFs towards the Organisational and Technical CSFs group.

To test the CSFs group model and verify Hypothesis 1, we conducted a multiple regression analysis; the results are presented in Table 5. The value of the adjusted R coefficient of determination indicates that 54.3% of the variance of the Project success may be explained by three predictors in the model. The model is significant at a 5% significance level and a good fit is present between the model and the data, so we can confirm that the model describes the data well. All the regression coefficients are positive as expected, but only the Human CSFs group is statistically significant at a 5% significance level and therefore makes a significant contribution in this model in predicting Project success. Since the Human CSFs group is a significant linear predictor of Project success, Hypothesis 1 is confirmed.

In the third key measurement, the participants were requested to *evaluate the actual level (quality) of the 15 selected CSFs in an ERP implementation project*, for which we assume they play a vital role in the implementation success, regarding the facts mentioned in the literature preview chapter. We therefore selected the most important HCSFs, among them observed PHFs from our research model (factors 7–10 in Table 6) and some CSFs that are most likely influenced by PHFs. The factors were evaluated with the Likert 1–5 scale, 1 meaning very inappropriate and 5 very appropriate.

The reliability test of the sample data showed that Crombach's Alpha is 0.917, by which the internal consistency was described as excellent. We calculated the descriptive statistics and Pearson correlation coefficients; the results are shown in Table 6. We can see that all four PHFs are in a significant positive correlation with project success, especially Competence with a strong correlation, which suggests it has a high potential impact on project success. Other CSFs that are in a significant positive correlation with project success are Right selection of ERP system, Risk management activities, Business process reengineering, and Working conditions in organisation. Project management activities and Availability of team members have an insignificant correlation with project success. When observing interrelations of the PHFs, we can see the significant positive correlation between Composition

Table 4: Descriptive statistics and the Pearson correlation of the CSFs groups

	Descriptive statistics		*Pearson correlation coefficients*		
n=21	**Mean**	**Std. dev.**	*Project Success*	*Human CSF*	*Org. CSF*
Human CSFs	2,95	0,865	**0,7446**	1	
Org. CSFs	3,38	0,590	**0,4368**	**0,5278**	1
Tech. CSFs	3,85	0,727	**0,5434**	**0,4659**	0,1333

Correlation is significant at the 0.05 level (1-tailed)

Table 5: Multiple regression analysis of the CSFs groups

					95% Confidence Interval	
Relationship	**Coeff**	**Std. err.**	**t stat**	**p-value**	**lower**	**upper**
Human CSFs => PS	**0,533**	0,190	2,811	**0,012**	0,133	0,934
Org. CSFs => PS	**0,141**	0,249	0,567	0,578	-0,383	0,665
Tech. CSFs => PS	**0,297**	0,193	1,537	0,143	-0,111	0,705
Model	R_{squ} = 0,611, Adj. R_{squ} = 0,543, p-value = 0,0009 < 0,05					

and Competence, and Behaviour (motivation and trust) towards Competence and Communication. This indicates that individual PHFs are in a significant interconnection and most likely have a combined impact on CSFs and project success.

To test the adequacy of the PHFs research model and verify Hypothesis 2, we conducted a multiple regression analysis; the results are presented in Table 7. The value of the adjusted R coefficient of determination indicates that 63.3% of the variance of the Project success may be explained by four predictors in the model. The model is significant at a 5% significance level and a good fit is present between the model and the data, so we can confirm that model describes the data well. All the regression coefficients are positive as expected, but only the first independent variable (factor), Competence, is statistically significant at a 5% significance level when the other three variables are present in the model and therefore makes a significant contribution in predicting Project success. As the Competence factor is a significant linear predictor of Project success, Hypothesis 2 is confirmed.

Subsequently, we conducted a stepwise regression with a backward elimination of the independent variables (factors) with the lowest t-values while observing the remaining factors' statistical significance. This method eventually eliminated two initially statistically insignificant factors, leaving the last two factors, Competence and Team composition as significant linear predictors in the adapted regression model, which is also statistically significant at a 5% significance level. The results are seen in Table 8.

4 Discussion

In this research paper, we conducted two statistical analyses to observe the impact of CSFs and to test the two stated hypotheses. In the first analysis, we evaluated the influence of the previously grouped CSFs into a Human, Organisational, and Technical group, towards the implementation project success and verified Hypothesis 1, which claimed that human CSFs have the most influence on the implementation project success. With the second analysis, we evaluated the influence of the selected CSFs, including the four observed PHFs from the research model, towards the implementation project success and verified Hypothesis 2, which claimed that among the primary human factors, competence has the most influence on project success. With the use of statistical tools, we confirmed both hypotheses.

The four elements of the proposed research model: Competence, Behaviour, Team composition, and Communication referred to as the Primary human factors were specially observed in this study, beside other influenced CSFs. The Pearson correlation coefficients reveal that all PHFs are significantly positively correlated to project success, exposing Competence with a strong correlation, which has on average the most important impact on project success. The regression analysis reveals that all PHFs coefficients are positive as expected and the regression model is a significantly good fit, but only one primary human factor, Competence, is statistically significant and makes a significant contribution in the proposed research model in predicting project success. Other independent variables (factors) provide an insignificant direct contribution to the project success. We therefore used a stepwise regression analysis with backward elimination of the insignificant variables, which finally revealed a corrected model with only two remaining PHFs, Competence and Team composition. Both are statistically significant and make a significant contribution in the corrected research model in predicting project success.

One of the possible interpretations of such results is that participants were asked to evaluate many CSFs, of which some were classified as primary factors and others as secondary or related factors. We should have increased

Table 6: Pearson bivariate correlation between project success and CSFs

	N=21	Mean	Std. Dev.	Project success	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Row 7	Row 8	Row 9	Row 10	Row 11	Row 12	Row 13	Row 14
1	Clear goal and objectives	3,52	0,814	0,4353	1													
2	Right selection of ERP system	3,76	0,831	**0,6938**	**0,5635**	1												
3	Realistic project constraints planning	3,00	0,775	0,3967	0,3174	0,5438	1											
4	Top management support	3,57	0,746	0,4352	**0,6352**	**0,7140**	0,5189	1										
5	Project management activities	3,33	0,658	0,1556	0,3112	0,1523	0,4903	0,1018	1									
6	Risk management activities	2,29	0,717	**0,6121**	0,1592	**0,7072**	0,2700	0,4270	-0,1059	1								
7	Composition of project team	3,05	0,865	**0,6769**	0,2471	**0,7125**	0,4479	0,4206	-0,0293	0,5414	1							
8	Competence of project team	3,33	0,966	**0,8058**	0,4665	**0,6644**	0,5345	**0,5547**	0,2883	0,4330	**0,7582**	1						
9	Effective communication	3,14	0,727	**0,5555**	0,3744	**0,5557**	0,2664	0,2106	0,1045	**0,5891**	0,4659	0,4983	1					
10	Motivation and trust	3,48	0,814	**0,6978**	**0,5863**	0,4719	0,2380	0,3529	0,2490	0,2693	0,5348	**0,6786**	**0,6400**	1				
11	Knowledge transfer	3,29	0,644	**0,5865**	0,3683	0,5075	0,2006	0,2676	0,2360	0,4642	0,3337	0,4825	**0,6564**	**0,5865**	1			
12	Cooperation between team members	3,29	0,784	**0,6385**	0,3024	**0,6471**	0,2471	0,4762	0,1938	**0,5592**	**0,5692**	**0,5943**	**0,6268**	**0,5601**	**0,8212**	1		
13	Availability of team members	3,48	0,814	-0,1331	-0,0935	-0,1937	0,3174	0,1059	0,2490	-0,2449	0,0372	0,1060	-0,2053	0,0180	-0,1773	-0,0672	1	
14	Business process reengineering	3,14	0,854	**0,6171**	0,3189	**0,6143**	0,3781	0,4933	0,1780	0,5018	**0,6678**	**0,7276**	0,3683	0,4011	0,2860	0,5339	-0,2469	1
15	Working conditions in organisation	3,24	0,700	**0,7563**	**0,5599**	**0,7896**	0,3687	0,4919	0,1446	0,4551	**0,5583**	**0,6158**	0,5191	**0,5808**	**0,6180**	**0,6897**	-0,2089	**0,6094**

Correlation is significant at the 0.01 level (1-tailed)

Table 7: Multiple regression analysis of the research model

					95% Confidence Interval	
Relationship	**Coeff**	**Std. err.**	**t stat**	**p-value**	**lower**	**upper**
Competence => PS	**0,432**	0,202	2,144	**0,048**	0,005	0,859
Behavior => PS	**0,218**	0,210	1,039	0,314	-0,227	0,662
Communication => PS	**0,115**	0,201	0,573	0,575	-0,311	0,541
Composition => PS	**0,116**	0,198	0,587	0,566	-0,304	0,536
Model	R_{squ} = 0,706, Adj. R_{squ} = 0,633, p-value = 0,00037 < 0,05					

Table 8: Stepwise regression analysis of the adapted model

					95% Confidence Interval	
Relationship	**Coeff**	**Std. err.**	**t stat**	**p-value**	**lower**	**upper**
Competence => PS	**0,673**	0,135	4,976	**0,0001**	-0,326	1,330
Composition => PS	**0,238**	0,136	1,626	0,0344	-0,078	0,495
Model	R_{squ} = 0,772, Adj. R_{squ} = 0,747, p-value = 0,0000017 < 0,05					

the focus of the participants' evaluation only on the primary factors and subsequently evaluate the relations to other related CSFs. In that case, we believe we could obtain much more accurate results.

With this interpretation, we are able to answer our key research questions: Human CSFs are the most important group of CSFs as they have the strongest impact on project success. The adapted PHFs model consists of two verified primary human factors, Competence and Team composition with a significant statistical contribution to project success. We nevertheless suggest the use of the complete model with the other two unverified PHFs, Behaviour and Communication, included to cover the complete causal structure and to provide a comprehensive analysis of the primary human factors that are critical for project success.

The findings of this research are consistent with the research carried out by the following researchers. Ram and Corkindale (2014) have come to the conclusion that merely identifying possible CSFs is not sufficient in helping with the ERP success. Williams and Ramaprasad (1996) also noted that although CSFs are widely used by academic researchers and practitioners, it is important to distinguish between different levels of their criticality. Many researchers confirmed the strong impact of the human factors to the implementation project success (Al-Hadid et al., 2015; Huang, 2010; Lin et al., 2009; Vilpola et al., 2005; Wang et al., 2007). Many authors also confirmed a significant correlation between Competences and the ERP implementation project success (Charland et al., 2015; Massini and Wassenhove, 2009), especially knowledge has been suggested as the most important CSFs (Sedera and Gable, 2010; Deng and Bian, 2007; Gable et al., 1998; Grant, 1996). A few authors (Akkermans and Helden, 2002; Gandhi, 2015) researched the causal aspect of CSFs and their interdependence (causes and consequences), which suggests this was the right direction for our study. Due to the lack of an appropriate existing model or at least some additional in-depth literature addressing the true causes behind CSFs from a human factors perspective, we independently developed an interesting new model with a completely different approach.

A further research possibility would be to test the proposed two-levelled research model and measure the influence of the independent variables on PHFs and consequently on project success.

Another interesting task would be to study the individual cases of unsuccessful implementation projects and analyse them precisely with the Root cause analysis to identify the true causes of project failure and afterwards compare it with the proposed theoretical model to verify it.

5 Conclusion

The lack of a simple, yet comprehensive model to address the true causes behind CSFs from a human factors perspective therefore motivated us to identify the influencing primary human factors and develop the PHFs model as we believe it is a significant contribution to this important and widely researched topic. The proposed primary human factors model can be useful for project managers and HR specialists to assess the risk of PHFs when evaluating the human resources quality level in order to recognize their required potential needed in implementation projects. If appropriate PHFs are provided, individuals and teams can

increase their excellence and efficiency of the implementation and thus the possibility of project success. The PHFs model can therefore be used as a tool to help us understand the importance and influence of the primary human factors and to successfully predict any possible risks. If we are better in predicting potential risks, we are also better in preventing them. The proposed model suggests a new approach to address CSFs from a human factors perspective, for which we undoubtedly assert that they have an important influence on project success and are leading the way to human oriented ERP implementation approach.

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Model primarnih človeških kritičnih dejavnikov uspeha za implementacijo ERP sistema

Ozadje in namen: Mnogo raziskovalcev je preiskovalo najrazličnejše Kritične dejavnike uspeha (KDU) in različne vzroke za neuspeh projektov ERP implementacij. Kljub podrobnemu pregledu razpoložljive literature nismo našli ustrezne raziskave s celovitim pregledom dejanskih vzrokov, ki se skrivajo za KDU, z vidika človeških dejavnikov. Cilj raziskave je bil razviti in ovrednotiti model Primarnih človeških dejavnikov (PČD) in potrditi njihov pomemben vpliv na tradicionalne KDU ter uspešnost projekta implementacije.
Zasnova/Metodologija/Pristop: S pomočjo zbrane literature in uporabe vzročno-posledične analize je bil razvit celovit raziskovalni model PČD, ki smo ga preverili z empirično raziskavo. Izvedena je bila anketa s sodelujočimi iz različnih slovenskih podjetjih, ki delujejo v različnih branžah in ki so v preteklosti implementirala ERP sistem SAP. Model je bil preverjen na vzorcu 21 strokovnjakov iz 18 organizacij.
Rezultati: Rezultati so pokazali, da imajo PČD pomemben pozitiven vpliv na uspešnost projektov ERP implementacij, vendar sta samo dva dejavnika, Kompetence in Sestava projektnega tima, značilna linearna napovedovalca v prilagojenem regresijskem modelu in značilno prispevata k napovedovanju uspešnosti projekta. Rezultati tako potrdijo obe predlagani hipotezi in prilagojen regresijski model.
Zaključek: Raziskava izboljšuje razumevanje PČD ter potrjuje njihov pomemben vpliv na tradicionalne KDU in uspešnost projektov ERP implementacij. Predlagan model PČD omogoča projektnim vodjem in ostalim sodelujočim na projektu učinkovito oceniti tveganja posameznih KDU in nakazuje pot k človeku usmerjenemu modelu ERP implementacij.

***Ključne besede**: Projekt ERP implementacije, Kritični dejavniki uspeha, Model primarnih človeških dejavnikov*

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Business Model Innovation: Insights from a Multiple Case Study of Slovenian SMEs

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Background and Purpose: Business model innovation (BMI) has become increasingly important, especially in the fast changing business environment. While large enterprises approach these changes systematically, small and medium sized enterprises (SMEs) are left to their own resourcefulness. For the purpose of developing dedicated methods and tools to support different SMEs in addressing these challenges, we have conducted a multiple case study to gain insights into factors that drive SMEs to innovate their BM, how they approach BMI and what changes they made to their BM.
Design/Methodology/Approach: First the framework of analysis was developed based on BMI research frameworks identified in literature review. Then the multiple case studies were conducted following the case study protocol developed by Envision project.
Results: Based on the proposed framework the results of four Slovene SME cases revealed differences between enterprises regarding the drivers behind BMI and changes in usage of the different BMI elements.
Conclusion: Overall, the results suggest all four SMEs, coming from different sectors, are facing BMI challenges without systematically addressing it and without using any dedicated BM ontologies or tools.

Keywords: *business model, business model innovation, drivers of innovation, multiple case study*

1 Introduction

Every enterprise employs a particular business model (BM), either explicitly or implicitly. To design a BM that is more than just a good logic of doing business, enterprise needs to assess internal and external factors concerned with customers, suppliers as well as the broader business environment (Teece, 2010). Even after a suitable BM is designed and implemented an enterprise needs to continuously re-think, re-design and develop its BM to remain competitive over time (Amit & Zott, 2012; Chesbrough, 2007; Teece, 2010; Zott, Amit, & Massa, 2011).

BM tools has been recognized as a valuable for building competitive advantages (Teece, 2010) and driving enterprise growth and profit (Casadesus-Masanell & Ricart, 2010). Only product or process innovations are according to Chesbrough (2007) insufficient for an enterprise to build and sustain long-term competitiveness. Therefore business model innovation (BMI) is becoming indispensable in practice (Amit & Zott, 2012; Casadesus-Masanell & Zhu, 2013; Chesbrough, 2007). In the past, a number of enterprises have successfully innovated their BMs (e.g. Apple, Ikea, EasyJet, etc.) However, there are still many enterprises that failed to renew or innovate their BM as well (e.g. Eastman Kodak, Encarta - Microsoft, Iridium – Motorola).

Many business leaders have difficulties with how to define and approach BMI (Giesen, Berman, Bell, & Blitz, 2007) what may lead to failure. Casadesus-Masanell & Ricart (2010) argue that business leaders are searching for insights on how to approach BMI. Furthermore, Teece

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(2010) argues that BMs are often poorly understood, because they are rarely analysed. Recent research has contributed greatly towards the understanding of BMI (Florén & Agostini, 2015), but the lack of empirical investigation of BMI phenomenon (Casadesus-Masanell & Zhu, 2013) and lack of systematic research on how enterprises should approach BMI (Bucherer, Eisert, & Gassmann, 2012) is acknowledged.

For a more systematic approach toward BMI several BMI frameworks were established (e.g. Bucherer et al., 2012; Florén & Agostini, 2015; Mahadevan, 2004). The frameworks can help to systematically investigate similarities and differences between BMs (Bucherer et al., 2012), but have mostly failed to establish general findings. The identified BM frameworks have been developed based on theoretical foundations and studies of BMI approaches mostly in large companies, while studies often neglected small and medium enterprises (SMEs). However, the European Union SMEs represent 99,8 % of all enterprises and are key drivers for economic growth, innovation, employment and social integration (European Commision, 2014). Many European enterprises, SMEs and also large enterprises, still lack awareness and knowledge about approaches and proper tools on how to innovate their BMs (Envison, 2015).

The aim of this paper is to gain deeper understanding of drivers that stimulate SMEs to innovate their BMs. For that purposes we conducted case studies in 4 different SMEs in Slovenia. In particular, we investigated core elements, similarities and differences of origin, and types of BMI. Understanding of different BMI approaches in SMEs will contribute to wider knowledge base in this field, which will enable to develop proper support for BMI in SMEs.

The paper is organized as follows. After introduction, we present literature review on BMI. Next chapter presents methodology, which is followed by case analysis and findings. We end with conclusions.

2 Business model innovation

According to Morris, Schindehutte, Richardson, & Allen (2006) the term business model (BM) have received a lot of attention since the 1990s. The main factors behind its increasing popularity are the growth of internet and e-commerce, the emerging knowledge economy, the outsourcing and offshoring of many business activities (Teece, 2010). Business model concept has evolved over time from a term that refers to a way enterprise does business (e.g. Gebauer & Ginsburg, 2003) to ontologies of generic components that constitute business models (e.g. Bouwman, Faber, Haaker, Kijl, & De Reuver, 2008; Osterwalder & Pigneur, 2010). Despite the contribution towards understanding of BMI, there is a lack of clarity and definitional consistency as well as theoretical grounding in economics or in business studies (Teece, 2010). The definitions of business model are focused on value creation (Teece, 2010), customer value (Osterwalder & Pigneur, 2010), customer and the enterprise value (Bouwman et al., 2008) or on the economic value (Gordijn & Akkermans, 2001). In this paper, we use the BM definition proposed by Osterwalder & Pigneur (2010, p. 14): "a business model describes the rationale of how an organization creates, delivers, and captures value".

A business model is not static. It has to be managed and innovated over time (Chesbrough, 2007; Hedman & Kalling, 2003). Companies must continuously evaluate, adjust and develop their business models to remain viable and sustain future growth (Amit & Zott, 2012; Teece, 2010; Zott et al., 2011). The body of knowledge in this field is still rather immature. There are many different and partially contradictory definitions that represent a potential source of confusion (Florén & Agostini, 2015). Based on the literature review we identified two directions towards the understanding of BMI. BMI can be understood as a supporter of other types of innovation or as a sustainer of BMI uniqueness (Amit & Zott, 2012; Teece, 2010). In ENVISION project the following definition of BMI was adapted (Pucihar, Kljajić Borštnar, Heikkilä, Bouwman, & De Reuver, 2015): "BMI is defined as changes in business logic, that are new to the focal firm, yet not necessarily new to the world, and have to result in observable changes in the practices of a BM".

There are different frameworks available for analysing BMI (e.g. Bouwman, MacInnes, & De Reuver, 2006; Bucherer, Eisert, & Gassmann, 2012; Florén & Agostini, 2015; Mahadevan, 2004). These frameworks mainly include the following aspects: the foremost reasons for enterprise to engage BMI (Bucherer et al., 2012; Carayannis, Sindakis, & Walter, 2014; Mahadevan, 2004), core BM elements that can be changed (Florén & Agostini, 2015; Mahadevan, 2004) and types of BMI (Bucherer et al., 2012; Florén & Agostini, 2015). The most compiling reasons for enterprise to engage BMI are cost reduction and flexibility (Pohle & Chapman, 2006). There are also other reasons (e.g. technology development, competition, legislation) behind BMI engagement and therefore several authors generally distinguish internal and external origin of BMI (Bucherer et al., 2012; Sorescu, Frambach, Singh, Rangaswamy, & Bridges, 2011). Carayannis et al. (2014) observe that BMI seems to be driven by internal and external opportunities and threat identified by Bucherer et al. (2012). These identified drivers may influence the change of core BMI elements. These elements usually origin from the existing business model ontologies (e.g. Bouwman et al., 2008; Johnson & Christensen, C. M. Kagermann, 2008; Skarzynski & Gibson, 2008). The level of changes of core BMI elements leads to the different types of BMI. Some authors differentiate between disruptive and incremental BMI (e.g. Comes & Berniker, 2008; Markides, 2006). Others argues that BMI covers changes from incremental

adjustments to more radical changes, proposing a classification that distinguishes more than two before mentioned extremes (Bucherer et al., 2012; Florén & Agostini, 2015; Schaltegger, Lüdeke-Freund, & Hansen, 2012).

2.1 Framework of analysis

We combined two research frameworks for BMI that represent the synthesis of the existing findings of business model innovation research (Bucherer et al., 2012; Mahadevan, 2004), with the ultimate aim of providing more comprehensive and systematic analysis for our cases. Using critical dialogue with co-researchers the key elements of each framework that needed to be excluded, retained or amended in the combined framework were identified. This new framework of analysis consists of three key aspects of BMI: origin, core elements and types of BMI (Figure 1). The first two key aspects were retained from above mentioned frameworks while the third type of BMI aspect was amended. Instead of using types of BMI identified by Bucherer et al., (2012) and Mahadevan (2004), the four types proposed by Schaltegger et al. (2012) were chosen as most appropriate for this research.

Origins of BMI

The innovation can be triggered in different ways. According to Bucherer et al. (2012) there are four different origins of BMI: internal opportunity (e.g. improvement of internal processes), external opportunity (e.g. changes in key technologies), internal threat (e.g. the outsourcing of certain activities or investment in new capabilities), external threat (e.g. competitive threat, market shift, legal changes). There can be only one origin of BMI or combination of more dimensions at the same time. Additionally, it is not necessary that specific origin of BMI triggers only one BMI of the enterprise. Enterprise can have multiple BMs and support multiple business logics, dependent on product/service market combinations and market segmentation (Pucihar et al., 2015). Last but not least an enterprise can perceive the specific trigger as an opportunity or as a threat. For instance, the changes in key technologies can one enterprise see as an opportunity that leads to improvement of processes or even new product/service generation, and another enterprise as a threat, because of the employee reluctance to learn and adopt novelty.

Core elements of BMI

Mahadevan (2004) argues that there are three core elements of a BMI, including "who", "what" and "how". The "who" element addresses the appropriate identification of customer and their needs in order to decide the value proposition ("what") that needs to be provided to the targeted segment. When these two elements are set, the "how" element (value delivery system) can be configured. This element includes the operational aspects of the business (e.g. decisions about type of product and process technology to be adopted, asset configuration, the extent and nature of interactions with other supply chain elements) (Mahadevan, 2004).

To obtain more detail analysis, we have further divided the three core elements of BMI into sub-elements. The "who" element was divided into market area (What is the market area of the enterprise? - National and/or international) and types of markets (Which customers do the enterprise choose to serve? - business market and/or customer market and/or governmental market). The "what" element was divided into product offering and service offering. The "how" element we divided into value chain (How is enterprise configured to deliver value proposition to customer? - In-house and/or outsource), organization (How the enterprise sustains and enhances competitive advantages? - Employee deployment and/or employee

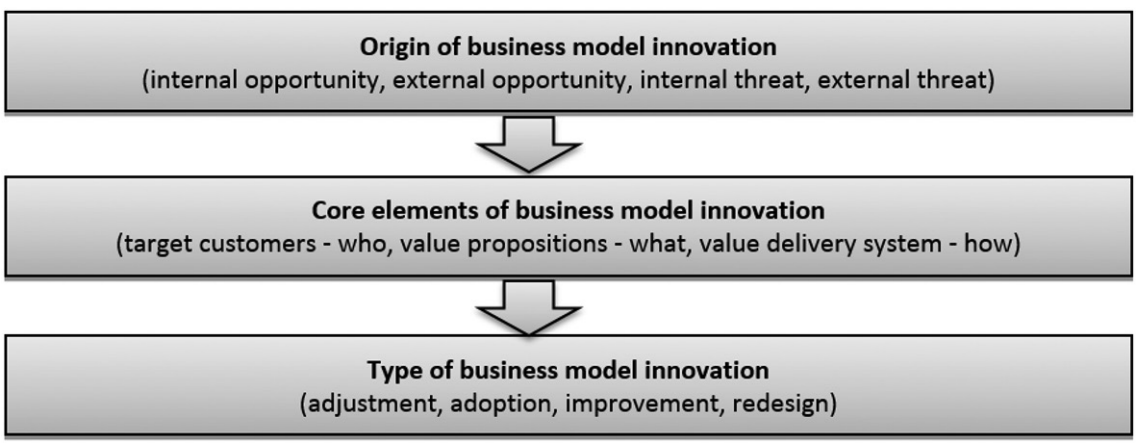

Figure 1: Framework of analysis (adapted from Bucherer et al., 2012; Mahadevan, 2004)

development) and Information technology (IT) (How the enterprise exploits IT technology? - IT as a product/service enabler and/or IT as a promotion/sales channel). Employee deployment is understood as realignment of human resources to new work assignments or job responsibilities to meet operational needs (BC Public Service Agency, n.d.). Employee development is understood as providing learning conditions for employees to develop current skills and gain new ones (Lee & Bruvold, 2003).

Types of BMI

The changes in the elements of BM influence the degree of BMI. In general many authors (e.g. Zott & Amit, 2002) categorise BMI as radical and incremental. While the spectrum of possibilities lies across a continuum in practice (Bouwman et al., 2006) we adopted four types of BMI proposed by Schaltegger et al. (2012), that includes:

- BM adjustment refers to changes of only one business model element or a minor number of business model elements. The element of value proposition (i.e. modification of customer relationships, business infrastructure, or financial pillar alone constitute improvements) is in this stage excluded.
- BM adoption refers to changes that are made in order to match competitors' value propositions.
- BM improvement refers to changes of a major number of business model elements (e.g. customer relationship approaches, infrastructure elements), except the value proposition is not changed.
- BM redesign refers to changes that lead to a completely new value proposition, offering new products, services or product-services systems.

3 Methodology

For the purpose of this study multi-case study research, as a suitable methodology for obtaining insights into BMI approach, was used. The case study research method described by Yin (2009) was adopted. The case study research consists of design, data collection and analysis phases proposed in the Case Study protocol (CSP) of ENVISION project (Pucihar et al., 2015).

In the design phase the selection process, criteria and sampling method was determined. Sampling was purposeful; at least one of the cases has to qualify as a family business and one of them as a female business. These selection criteria were chosen because it is estimated that on average half of EU SMEs are family businesses (Mandl, 2008) and women entrepreneurs make up 29 percent of all European entrepreneurs (European Commission, 2014). An enterprise was considered as a family business, if the enterprise met the criteria proposed by Family Business Expert Group (2009). A female business was considered as a female entrepreneur which was defined by European Commission (2004) as, "woman who has created a business in which she has a majority shareholding and who takes an active interest in the decision-making, risk-taking and day-today management." Based on selection criteria Slovenian micro and small enterprises were invited to participate in the study. We analysed case studies of the first four SMEs that were willing to participate in the study.

Data collection methods, defined by CSP (Pucihar et al., 2015) were based on the preliminary investigation of available resources (business reports, web sites, media coverage) and semi-structured interview. The semi-structured interviews were conducted to gain a deeper understanding on BMI in selected enterprises. Different business model templates were used to encourage discussion. The interviews were recorded and transcribed. The transcription and other information gathered before and during the interview served for case study report preparation. Some additional insights were gathered through e-mail, phone call or in additional short meetings. Each case study report was sent for approval to the enterprise contact person.

4 Case Analysis and findings

The four micro and small enterprises included in the study represent different sectors of the Slovenian economy. Our analysis was focused on drivers behind the BMI, changes made in BM and the level of BMI. First, we present a brief overall description of each enterprise, following with detail comparative analysis of cases. We conclude this chapter with the aggregated findings.

4.2 General characterictics

SME A
SME A is a family business that was founded in 1993. At the beginning the enterprise was focused in building log cabins, garages, pergolas and making wooden panelling, floor, slats, etc. Later on, in 2006, the enterprise shifted their value proposition to the production of wood biomass.

SME B
SME B is a female business that was founded in 2004. It provides a variety of handmade high quality leather shoes, hand bags and accessories with hand painted details.

SME C
SME C was founded in beginning of 1990's as internet service provider and has transformed over the years into high tech IT service and solutions provider in the field of High Performance Computing (HPC). Today it offers services of supercomputer infrastructure to their clients and provides them system administration, optimization and parallelization of code, cloud computing services, web and mobile application development services and project management

SaaS services.

SME D
SME D is a family business established in 1992 based on their tradition and inherited chocolate recipes from their ancestor. Today SME D produces more than 150 different kinds of confectionary (sweets) products. They also offer customized products for individual/custom orders.

4.3 Comparative analysis

Origin of BMI
The drivers behind BMI in SME A are opportunities in the wood biomass market. While the production of wood biomass is quite fragmented they see the opportunity in connecting and collaborating with other wood biomass providers in Slovenian market. On the other hand, the internal opportunities are also present. The younger generation is more risk-taking oriented and therefore they start to collaborate with their competitors and participate in the projects (e.g. establishment of a biomass district heating system for a six apartment blocks for which they received an EU grant).

SME B main driver for the innovation was internal threat related to the time management challenges. The owner wanted to dedicate more time to design and make new products, but without any help she was not able to run the store and to have sufficient number of products on the stock at the same time. The owner also noticed that the Slovenian market is too small for the unique products that she offers and she sees the potential in foreign markets (external opportunities).

SME C drivers behind BMI are a combination of internal (highly skilled experts) and external opportunity (emerging technologies which they combine together with specialized customer focused services to solve customers' problems).

SME D drivers behind BMI are also combination of internal and external opportunity and external threat. Internal opportunities are driven by joy to produce high quality products which will be successful on market. External opportunities are more related to geographic positioning of enterprise stores locations in such a way to attract high number of visits of customers in their stores. The enterprise also encounters external threat in a form of high level competition, especially when the enterprise participates in public procurement markets.

Core elements of BMI

Who
SME A has the customers not only in Slovenia, but also in neighbouring countries. They are doing business with other companies, end customers and also with public institutions. The majority of customers are companies. In Slovenia they have fewer customers but they are trying to position themselves as relying supplier for wood biomass.

SME B does not know their customers very well, because its aim is to design and create unique leather products. The store is located in Bled, one of the most popular Slovenian tourist destinations. The customers are mostly foreign tourists and local people who know the brand and/or like that kind of art.

SME C operates on both national and Central Europe market depending on type of services offered. They are primarily focused on offering services for other enterprises, only small part of their service portfolio is offered to end customers.

SME D main customers are tourists and also some local customers which are most often returning for their high quality confectionary products. The remaining share of their revenues comes from business and governmental market during high season for business gifts and presents around New Year's holidays. Time to time they get orders from abroad.

What
SME A the main goal is to offer all available wood biomass heating options in order to meet variety of customers' needs regarding wood biomass and maintain a competitive advantage. They exactly know what the trends in the production of wood biomass are and how to satisfy their customers. They are also offering log cabins, garages, pergolas, etc. but they are currently focused more on production of wood biomass.

SME B mainly relies on the creativity and the quality of the products. The added value for the customers is uniquely designed high quality products (shoes, bags, and accessories) with various hand techniques used.

SME C provides their clients end to end IT solutions for their problems. They are offering services on their own HPC platform or they guide clients for building their own HPC infrastructure. They are also offering classical IT system administration and software application development services. In addition, they are also specialized for implementation of their own cloud based project management solution; therefore they offer various services.

SME D has a large portfolio of more than 150 handmade chocolate pralines and chocolates. Their main value offering is high quality handmade chocolate confectionaries, constant quality of products and customized confectionary products for corporate customers.

How
SME A is a small enterprise with limited resources and capabilities. Without the help of their partners' network they would not be able to offer all the available wood biomass heating options. They have good connections with the companies in Austria, which is one of the leading countries in the field of wood biomass usage. The knowledge

they achieve through those connections helps them to be ahead of the Slovenian competition. The director is the one who transmits the achieved knowledge to employees and encourages them to gain new skills. In 2015, because of the growth of the enterprise, they needed to reassign their employees to new assignments and even employ new employees. The enterprise is very flexible and is willing to take risks to achieve competitive advantage. All the gained profit is invested in development of the enterprise, especially in biomass technologies.

SME B is also relying on partners. In order to make high quality products, the enterprise needs to have suppliers that offer (raw) material of high quality (e.g. leather, dye). While the enterprise is more focused on design and painting, the sawing part is executed by reliable subcontractor. Enterprise needs only basic tools such as scissors, skiving knifes, brushes. Besides, the creativity a lot of time without distractions is needed. While working in the store and making the product at the same time was not very productive, hiring an assistant to help in the store was the most logical option. In the beginning the assistant only helped in the store, since recently she also helps managing the paperwork. In order to attract the customers from abroad the enterprise created an online store and is involved in social media.

SME C uses state of the art IT infrastructure to deliver new services in domains where IT have not been used before. They also partner with other R&D institution like universities and research institutes in order to keep up with rapid development in the field they are operating. They also partner with their clients for specific improvements and upgrades of their existing product and service portfolio. SME C is typical project type of enterprise and they would assign their employees to projects. They have weekly meetings (planning work) and monthly meetings (overview of the main activities and the status of projects) which can also result in reassignment of employees to different projects where needed.

SME D on the other side heavily rely on their own resources to deliver products to the market. They have their own independent production of their products. Sale of products heavily depends on customers visits to their stores. They typically partner with touristic service providers to include stop of touristic bus at their store location which enable tourists to buy some authentic locally produced confectionary item in theirs stores. SME D has smaller number of core employees at their production location and number of contract employees who are deployed dynamically where needed to work in stores to sell the products or in chocolate production mainly in packaging activities. They also have an online store.

Types of BMI

SME A is following good practices in the field of wood biomass and has changed value proposition (offering all available wood biomass heating options) as well as some other BM elements. First of all the SME A changed the approach towards the customers, especially the foreign companies. They connected with partners who have connections with the foreign companies who are using wood biomass. Similarly, they are trying to convince other providers of wood biomass to work together on bigger projects that individual enterprise (biomass provider) is not capable to cover. Enterprise also reassigns their employees to new assignments and bought additional technologies for the biomass production. The enterprise classifies to BM redesign type of BMI.

The owner of SME B is driven artist; she enjoys designing new products, and less running a business. She saw the change of the legal status as an enabler for other changes of BM. She was finally able to employ an assistant to help her with daily tasks. Consequently she had more time to design new products, produce more products, launch online store and be more active on social media. Furthermore she encounters some negative consequences. Before the change she did not need to run an inventory. She was also not liable to tax in a way that sole proprietorship is. While she could not afford to increase the prices of her products for 22% (general tax rate of VAT), her work became less valued. Furthermore, she has additional salary expenses (payment for her assistant). The enterprise classifies to BM improvement type of BMI.

SME C is usually upfront market trends and thus has to redesign the BMs to adjust the value proposition to the potential customers. For instance, at the beginning their idea was to lease only infrastructure for HPC, but this did not generate enough revenue to cover the high maintenance costs, let alone to create profits. Therefore they started to lease HPC along with specialized services in the cloud and focused mostly on manufacturing SMEs. The enterprise classifies to BM redesign type of BMI.

SME D has more stable BM and they only introduce incremental changes into their offering. Two years ago they renewed their website and introduced online shop. Each year they introduce a couple of new products and if they are a success on a local market, they start to sell them in all of their stores. The enterprise classifies to BM adoption type of BMI.

The aggregated findings of comparative analysis are presented in Table 1. The table was used to derive an overview of BMI key drivers, core elements of BMI and type of BMI for each of four cases. The changes are labelled as x.

4.4 Findings

Surprisingly, all four enterprises have made changes of the BM elements, some even new value proposition. It seems that all the interviewees mentioned only major changes because small changes are made on a daily basis and compa-

Table 1: Aggregated findings of comparative analysis

Criteria based on framework of analysis				SME A	SME B	SME C	SME D
Origin of BMI	Internal opportunity			x		x	x
	External opportunity			x	x	x	x
	Internal threat				x		
	External threat					x	
Core elements of BMI	Who	Market area	National	x	x	x	x
			International	x	x	x	x
		Types of markets	business market	x		x	x
			customer market	x	x		x
			governmental market	x			x
	What	Types of offering	Product	x			
			Service	x		x	
	How	Value chain	In-house	x	x	x	x
			Outsource	x	x	x	
		Organization	Employee deployment	x	x	x	x
			Employee development	x		x	
		Technology	IT as a product /service enabler			x	
			IT as a promotion /sales channel		x		x
Types of BMI	Adjustment						
	Adoption						x
	Improvement				x		
	Redesign			x		x	

nies do not perceive them as innovation of their BMs. This assumption is made based on the interview with the SME C. The interviewee said, "We are constantly changing, facing minor as well as major changes. The major changes are planned, approached more systematically, while the minor changes are usually executed without preparation and in parallel with other daily assignments." Therefore we agree with Teece (2010) who states that minor changes in the manufacturing process usually does not require BMI.

All four cases are well established SMEs, being on the market for more than 10 years. They have encountered several major changes in the time of their existence but none of them have used any of known BM ontologies or tools. For example, one very interesting quote that interviewee from SME A has stated is, "My concerns are that, if our growth rate will continue, I will not be able to have everything in my mind and I think that some sort of simple BM tools would be of significant value for me."

The analysed companies have changed few or several core elements of BMI. While they are constantly making minor changes, the major changes are usually made every few years. The changes in the four analysed cases are not categorized as of a same type of BMI, because not all of the cases have made changes that lead to completely new value proposition. Among all four analysed companies only SME B did not consider BMI as successful. The owner said, "The changes are not considered successful so far." Perhaps because the owner is driven artist with lack of interest in running a business. Interestingly, among the three companies that considered changes in their BMI as successful, only SME A acknowledged growth in the profit. Director said that they acknowledge "Approximately 300 to 400% growths in last several years."

Two of four analysed companies are offering different product or services that require different business logics. Both companies, SME A and SME C, have made major

changes only in the business logic of one product or service, namely the one they are currently focused on. For example SME A changed only business logic of wood biomass, while business logic of other products remains the same. The owner has stated, "We are currently focused only in the wood biomass, because it represents 90 % of all revenue." Furthermore, SME C even argue that their business model is new to the market, because they do not provide only HPC infrastructure like for example Amazon but they also offer to lease HPC along with specialized services. The development of new business model is excellent way for managers to develop experiences and competences, but it also a risky business (Kurowska-Pysz, 2014).

Last but not least, IT technology was identified as BMI driver as well as a part of BM element that was changed. IT as a BMI driver was identified only by SME C, while other three SMEs did not give considerable emphasis on IT. Nevertheless, all four analysed companies have invested into technology development, not only IT. SME A mostly invested in the development of wood biomass production technologies while the other three companies mainly in the ICT technologies. SME C has heavily invested in ICT and HPC, as IT services are their core business, while companies B and D have developed their presence on the internet (web store, social media profiles).

5 Conclusion

BMI has become a key concern for enterprises to stay competitive and successfully overcome nowadays challenges from rapid changing business environments. However, most of the enterprises, especially SMEs have little knowledge and awareness about critical importance of BMI systematic approach, and supportive methods and tools that could be used.

The present paper analysed this issue based on four case studies. Our findings were validated by theoretical insights from the field of BMI. Contributions of this paper are twofold. First, we proposed framework for BMI case study analysis, which has been developed based on prior frameworks. Second, we performed a comparative analysis between four SMEs, two of them being family and one female business. More specifically, we investigated similarities and differences of origin, core elements and types of BMI in four different SMEs in Slovenia.

The main conclusion is that the external opportunity is the main driver that influences SMEs decision to innovate their BM, but it is not the only one and is usually combined with at least one internal driver. Regardless of the drivers, one should expect that family businesses are more careful and not prepared to conduct major changes of BM. In one of the cases we showed the contrary. Perhaps the younger generations are more willing to take risk, even though they can endanger income for the whole family. Regarding the female business we cannot draw any conclusions because we have only one case. Overall, all four analysed SMEs approached BMI intuitively, usually using only spreadsheets or other similar tools.

Given that literature review revealed very few studies have given focus on BMI in relation to SMEs, the findings of this study provide some useful insights regarding the BMI practices in SMEs. However, there are also limitations of this study. First limitation of this study is mainly concerned with the number of cases currently conducted for this study. Another limitation is that all the cases, presented in this paper are done in one country. Further research should focus on more cases, including SMEs of various sizes, from various industries and various countries. This will be done in the scope of Envision project. Last but not least, for more detailed analysis the proposed research framework needs further elaboration. Currently this BMI research framework is suitable to reflect the four cases, but may not be completely adequate for analysis of cases that will follow. For instance, in the element how we did not cover revenue streams and under the technology sub-element only IT technologies were considered. Therefore we suggest further enhancement of BMI research framework and more comprehensive review of the business model literature in order to identify important missing elements of BMI.

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Inoviranje poslovnih modelov: Spoznanja iz študij primerov malih in srednje velikih podjetij v Sloveniji

Ozadje in namen: Inoviranje poslovnega modela (IPM) postaja bolj in bolj pomembno še posebej v hitro spreminjajočem se poslovnem okolju. Medtem ko se velika podjetja lotevajo teh sprememb sistematično, so mala in srednje velika podjetja (MSP) prepuščena lastni iznajdljivosti. Za namen razvijanja metod in orodij namenjenim podpori inoviranju poslovnih modelov v MSP podjetjih, smo naredili študijo več primerov, da bi pridobili vpogled v dejavnike, ki vodijo MSP podjetja v inoviranje lastnih poslovnih modelov, spoznali kako pristopajo do le-tega in katere spremembe so naredili v lastnem poslovnem modelu.
Oblikovanje/Metodologija/Pristop: Najprej smo razvili okvire analize na osnovi pregleda literature raziskovalnih okvirov inoviranja poslovnih modelov. Nato smo izvedli študijo več primerov, sledeč protokolu študij primerov razvitem v okviru projekta Envision.
Rezultati: Na osnovi predlaganega okvira analize so rezultati štirih slovenskih MSP pokazali razlike med podjetji glede na različna gonila za inoviranjem poslovnega modela in spremembe različnih elementov IPM.
Zaključek: Na splošno, spoznanja kažejo, da se vsa štiri proučevana podjetja, vsako iz različnega sektorja, soočajo z izzivi IPM ne da bi do njih pristopali sistematično in ne da bi uporabljali ontologije ali orodja poslovnih modelov.

Ključne besede: *poslovni model, inoviranje poslovnega modela, gonila inovacije, študija primerov*

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An Empirical Study of the Relationship between Entrepreneurial Curiosity and Innovativeness

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Background and Purpose: Despite scholarly interest in understanding the role of different determinants on entrepreneurs and their behavior, little is known about the relationship between entrepreneurial curiosity and innovativeness. This research explores the relationship between entrepreneurial curiosity, which motivates entrepreneurs to gather information about their business and innovativeness that motivate entrepreneurs to incorporate innovations into entrepreneurial processes.
Design/Methodology/Approach: Participants in this study were entrepreneurs from Slovenia and USA. By using structural equation modelling, we linked the two constructs of entrepreneurial curiosity and innovativeness to test the influence.
Results: Results indicate that entrepreneurial curiosity positively influences innovativeness. The results of this study indicate that at the frame of entrepreneurship psychology entrepreneurial curiosity is important for innovativeness.
Conclusion: This paper links the two studied constructs and presents a valuable contribution for entrepreneurship theory; therefore, the results could be used for a further scientific research as also for practical implications.

Keywords: *Entrepreneurial Curiosity, Innovativeness, Company, Entrepreneurship, Entrepreneur*

1 Introduction

The nexus of entrepreneurship, innovation and sustainable development is a subject of great interest nowadays, as society is looking for solutions leading to sustainable development (Kardos, 2012). This paper studies the relationship between entrepreneurial curiosity as a determinant which influences entrepreneurs and innovativeness as an important part of economic dynamism. Understanding entrepreneurial cognition is imperative to understanding the essence of entrepreneurship, how it emerges and evolves (Krueger, 2003). Entrepreneurs' innovativeness and personality play a key role in the adoption of innovations in Small- and Medium-sized Enterprises (SMEs) (Marcati, 2008).

There is no consensus on how to define the entrepreneur in the economics literature (Ünay and Zehir, 2012). Since SMEs are a key source of innovation and economic growth (Schelmelter, 2010) the entrepreneurs who answered the survey can give us up to date data about situation in their organizations and on the market. Entrepreneurs are the key

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factors of entrepreneurship, which contributes to the quality and future hopes of a sector, economy or even a Country, where the role of the entrepreneurs is crucial in creating value (Huarng and Ribeiro-Soriano, 2014). Current multi-country empirical research was conducted among SMEs in Slovenia and USA. Surveys were sent to entrepreneurs; the founders or the owners of the company to where the survey was sent. The values and orientations of firms thus differ between those who actively search for new solutions and those who maintain a more inward-looking or possibly downstream focus on innovation processes: incremental innovations are often associated with a focus on existing customers (Grundström et al., 2012). In this research, the focus was oriented towards innovative entrepreneurs who actively try to improve their work, their products / services, try to sell new things on the steady way or to sell steady products / services based on modern approaches.

Human action has many roots, yet most researchers – even most philosophers – would argue that decision precedes action (Audi, 1993; Kosec and Miglič, 2012). Entrepreneurs are acting on the base of many factors and determinants, internal and external. This paper investigates how entrepreneurial curiosity influence on innovativeness among entrepreneurs in Slovenia and USA. Thus, the origin of entrepreneurial curiosity seems to have some common points with innovativeness; these constructs deal with the modern type of entrepreneurs who want to expand business and improve their business results. The dynamics of disequilibrium and market disruption postulate that continuous innovation serves as a vital role for firms to gain sustainable competitiveness in a dynamic environment (Yu et al., 2013) and the entrepreneurs are the main source of energy for involving the innovative approaches into the business and into economy as a whole system.

The primary aim of the paper was to reveal a connection between entrepreneurial curiosity and innovativeness among the entrepreneurs. Following Fairlie and Holleran (2012) who wrote that promoting entrepreneurship is viewed as a national priority by governments around the world; an additional aim of the paper is to promote entrepreneurship in order to present it to the broader audiences. Entrepreneurship is the main generator of the new jobs and the fundamental reason for the sustainable development.

Based on Kardos (2012) the relationship between entrepreneurship and sustainable development has been addressed by various streams of thought and literature such as:

- Entrepreneurship, environmentally orientated entrepreneurship;
- social entrepreneurship - entrepreneurship that aims to provide innovative solutions to unsolved social problems OECD (2010);
- institutional entrepreneurship, contributing to change regulatory, societal and market institutions, responsible entrepreneurship - a term coined by the UN Environmental Program in the context of Agenda 21, meaning "healthy" entrepreneurial business, which joining economic, technological, environmental factors is or must be responsible to society, enhancing the business positive contribution to society whilst minimizing negative impacts on people and the environment responsible entrepreneurship.

Today, the role of innovation and market orientation has turned into an important competitive tool to sustain competitive advantage and survive in the global competitive market (Dess and Picken, 2000; Tushman and O'Reilly, 1996; Crossan and Apaydin, 2010, Candemir and Zallu-hoğlu, 2013). Therefore, it is not surprising that innovations and entrepreneurs are one of the main research topics lately in scientific and also nonscientific literature. The terms radical, really new, incremental and discontinuous are used ubiquitously to identify innovations (Garcia and Calantone, 2002).

Many authors define relationship between the innovation as the process and the output of that process (e.g. Tidd and Bessant, 2011). Literature review of scientific documentation revealed that innovativeness was connected to:

- firm performance (Craig et al., 2013);
- according to Schumpeter, innovation is reflected in novel outputs: a new good or a new quality of a good; a new method of production; a new market; a new source of supply; or a new organizational structure, which can be summarized as 'doing things differently' (Crossan and Apaydin, 2010);
- Dibrell et al. (2013) revealed in their study that firms' formal strategic planning processes and planning flexibility are positively associated, and each is positively related to innovativeness;
- innovation is the single business activity that most closely relates to economic growth (Soriano and Huarng, 2013) etc.

On the other site entrepreneurial curiosity was connected to entrepreneurial self-efficacy (Jeraj and Marič, 2013a); to openness and firm growth (Jeraj, 2014). Since both researched constructs in this paper, entrepreneurial curiosity and innovativeness are important elements of entrepreneurship and both were connected to other entrepreneurship parts. The relation of entrepreneurial curiosity to innovativeness till this study remained unexplored.

2 Entrepreneurial Curiosity

Literature review from the field of entrepreneurship, psychology, organizational sciences, sociology etc. revealed that researchers have an interest to study the psychology of entrepreneurs: e.g. cognitive psychology of entrepreneurship (perception, intention, belief structures etc.) (Krueger, 2003); entrepreneurs' dispositional positive affect (Baron

et al., 2012); person–entrepreneurship fit (Markman and Baron, 2003); entrepreneurial intuition (Blume and Covin, 2011); and others.

Interesting determinant influencing entrepreneurs is also entrepreneurial curiosity. According to Jeraj and Antončič (2013) the entrepreneurial curiosity construct and measure were developed in line with the steps recommended by Churchill (1979), Dawis (1987), DeVellis (2003), Gerbing and Anderson (1988), and Hinkin (1995). Entrepreneurial curiosity is defined as a positive emotional/motivational system oriented toward investigation in the entrepreneurial framework to learn tasks related to entrepreneurship and incorporate new experiences in order to improve business (Jeraj, 2012; Jeraj and Antončič, 2013; Jeraj and Marič, 2013b).

Entrepreneurial curiosity is an interest in novelties or observations of society and a tendency to search for answers that indicate which demands should be met and it also represents guidance and competitive advantages for entrepreneurs relative to the competition (Jeraj and Marič, 2013a). Entrepreneurial curiosity is awake, when an entrepreneur is facing different stimulus related to the entrepreneurship in the environment (Jeraj and Prodan 2010). Since this construct deals with different essential elements of entrepreneurship (e.g. market research, analysis of the competition, innovations, gathering important information and data, etc.) a relatively high level of entrepreneurial curiosity can represent value added in comparison to the entrepreneurs that have entrepreneurial curiosity on relatively low level.

Organizations (or, for that matter, communities) need to provide and develop a "cognitive infrastructure" that nurtures entrepreneurial thinking (Krueger, 2003). Thus entrepreneurial curiosity is a powerful engine in generation of business ideas and curious entrepreneurs obtain appropriate data and make decisions based on them (Jeraj, 2012). Further, some scholars have argued that entrepreneurial learning helps entrepreneurs develop their skills and knowledge, and so enhances their future performance (Cope, 2005; Rae and Carswell, 2000, Parker, 2013). According to Yu et al. (2013), the integration of knowledge and resources can reduce organizational inertia and strengthen a firm's innovativeness. Since Garcia and Calantone (2002) defined innovativeness as an iterative process initiated by the perception of a new market and/or new service opportunity for a technology based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention it is necessary to empirically test connection between entrepreneurial curiosity and innovativeness.

3 Innovativeness

Innovation is the ". . . process that turns an invention . . . into a marketable product" (Gabor 1970).

Among the many drivers of innovation, researchers have paid a growing attention to the internal factors leading to innovative behaviors by individuals (Marcati et al., 2008) where entrepreneurial orientation represent a strategic state of the company. Innovation is therefore more than invention; it also involves the commercialization of ideas, implementation, and the modification of existing products, systems and resources (Bird, 1989). Innovation matters, not only at the level of the individual enterprise but also increasingly as the wellspring for national economic growth (Tidd and Bessant, 2011).

Garcia and Calantone (2002) defined innovation as an iterative process initiated by the perception of a new market and / or new service opportunity for a technology based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention.

Tidd and Bessant (2011) further operationalized key characteristics of innovation as:

- Degree of novelty – incremental or radical innovation?
- Platforms and families of innovations.
- Discontinuous innovation – what happens when the rules of the game change?
- Level of the innovation – component or architecture?
- Timing – the innovation life cycle.

For higher growth of the company, it is necessary to become entrepreneurial oriented. Based on Dai et al. (2013) entrepreneurial orientation refers to a set of behaviors – namely innovativeness, proactiveness, and risk-taking – that have been found to influence international learning (De Clercq et al., 2005), speed of entry (Zhou, 2007), and performance (Zhang et al., 2012). There appears to be strong empirical evidence to support the claim that entrepreneurs, particularly those successful at growing an enterprise, are more innovative than non-entrepreneurs (Mueller and Thomas, 2001).

Due to fierce competition in the marketplace, globalization and an explosion of technology in recent years, innovation and differentiation are considered as a necessity for every company (Tajeddini and Trueman, 2008). On the one hand innovativeness can, and does, vary in complexity, ranging from changes to existing products, processes or services to the introduction of new breakthrough technologies that introduce first-time features, offer exceptional performance, or change the rules of the competitive domain (Craig et al., 2013) while on the other hand some innovation scholars argue that innovation types are artificial distinctions and that they are conceptually and operation-

ally alike (Edquist et al., 2001). In this study the concept of the innovation is perceived as a personal judgment of the entrepreneur about the level of his innovativeness.

4 Entrepreneurial curiosity and innovativeness

Based to Mueller and Thomas (2001) in describing entrepreneurs, Joseph Schumpeter noted that these were the individuals who attempted to "...reform or revolutionize the pattern of production by exploiting an invention... or untried technical possibility for producing a new commodity or producing an old one in a new way... [This] requires aptitudes that are present in only a small fraction of the population..." (Schumpeter 1934). Therefore, entrepreneurship and innovation can be viewed as different sides of the same coin (Soriano and Huarng, 2013).

According to Ünay and Zehir (2012) over the course of economic globalization, the innovation aspect of entrepreneurship has gained critical importance in almost all sectors. Firms that score high on entrepreneurial orientation are believed to be engaged in innovation frequently, to be more willing to take risks and to act more proactively when opportunities arise (Rezaei et al., 2012).

Operationally, organizational innovativeness development is associated with knowledge and resources that can carry strategic orientations to innovation (Yu et al., 2013). Entrepreneurial orientation reflects a firm's innovativeness, proactiveness, and willingness to undertake risks (Lumpkin and Dess, 1996). Sanchez-Franco and Roldán (2010) summarized that innovative people tend to seek out new, mental or sensual experiences (cf. Venkatraman 1991; Uray & Dedeoglu, 1997):

- (a) orienting their curiosity towards stimulating design,
- (b) making evaluations as to whether virtual services fulfil their initial experiential expectations, and
- (c) fostering users to stay.

Based on written above it could be predicted that curiosity, among other things influences innovativeness. Similar connection was perceived by Jeraj and Antončič (2013) who stressed that motivated individuals with a relatively high level of entrepreneurial curiosity could be involved in the entrepreneurial process and contribute to the innovativeness and growth of the company.

Deniz and Godekmerdan (2012) wrote innovativeness integrates problem solver, profit oriented R&D, curiosity oriented research, and further entrepreneurial curiosity is a powerful generator of business ideas (Jeraj and Antončič, 2013). Innovativeness involves the ability of the firm to promote new and creative ideas, products and processes designed to service the market (Lumpkin and Dess, 1996).

Innovation is essentially about change and it is often disruptive, risky and costly (Türker and İnel, 2012) that is why entrepreneurs must have some specific knowledge to make appropriate decisions. Innovativeness can be defined as "the notion of openness to new ideas as an aspect of a firm's culture" (Hurley and Hult, 1998). Since research of Jeraj (2014) show openness is connected to entrepreneurial curiosity and entrepreneurial curiosity influence company's growth as also innovativeness (e.g. Craig et al., 2013) and based on the theoretical predispositions that suggest entrepreneurial curiosity and innovativeness are connected the following hypothesis was formulated: "***Entrepreneurial Curiosity positively influences Innovativeness.***"

5 Method

5.1 Sample and data collection process

The sample consisted from randomly selected entrepreneurs from Slovenia and USA. The email addresses were collect from free online databases and the surveys were sent to 4,000 Slovenian entrepreneurs in Slovenian language and to 5,000 USA entrepreneurs in English. An average time for completing the survey was approximately 10 minutes.

The survey consisted from measures of entrepreneurial curiosity, innovativeness, some demographic questions, and questions about some parameters of their companies. 331 entrepreneurs responded from both countries and all answers were appropriate for statistical analysis since the online survey was programed in the way where was impossible to continue without answering all questions in the current page.

Multi-country sample consisted of 237 (71.6%) male and 93 (28.1%) female respondents (1 person undefined). 47.7% of entrepreneurs were Slovenians and 52.3% Americans. Regarding to the respondents' companies by sector the most entrepreneurs came from management and consulting business services (12, 4 %), then construction sector (11, 5 %), retail or wholesale trade (10, 9 %), manufacturing industrial goods (9, 4 %), banking, investment, insurance (8, 8 %), and others.

An analysis of the age of companies show that most companies included in our survey were from 11 to 20 years old (34, 4 %), then from 21 to 50 years old (30, 5 %), from 6 to 10 years old (13 %), from 2 to 5 years old (11, 2 %), more than 50 years old (10 %), and as the least class less than 1 year old (1, 5 %). 78,5 % of entrepreneurs were at least once in a life employed in the company that was not theirs.

5.2 Description of measures

Innovativeness was measured using the Jackson Personality Inventory, which Mueller and Thomas (2001) adopted

Table 1: Innovativeness measure (*These items were reverse scored before scoring and analysis.)

	INNOVATIVENESS
1.	I often surprise people with my novel ideas.
2.	People often ask me for help in creative activities.
3.	*I obtain more satisfaction from mastering a skill than coming up with a new idea.**
4.	I prefer work that requires original thinking.
5.	*I usually continue doing a new job in exactly the way it was taught to me.**
6.	*I like a job which demands skill and practice rather than inventiveness.**
7.	*I am not a very creative person.**
8.	I like to experiment with various ways of doing the same thing.

Table 2: Entrepreneurial Curiosity measure

	ENTREPRENEURIAL CURIOSITY
1.	While doing market research, I focus on the work so much that I lose track of time.
2.	When I notice an abandoned building, I think about what business potential it represents for me.
3.	It bores me to always watch the same products; therefore, I think about improving and offering them to the market.
4.	I explore new things that could create additional profit.
5.	I am interested in other entrepreneurs' interests.
6.	In entrepreneurial work, I am mostly interested in competition.
7.	In my business, I must have information about marketing that is as complete as possible.
8.	I am able to create added value from my observations of the environment.

from (Jackson 1994). The Jackson Personality Inventory Manual (JPI), which defines innovativeness as a tendency to be creative in thought and action, was used to capture this construct as innovation, creativity, and initiative have been consistently identified as one of the enduring characteristics of entrepreneurs (Mueller and Thomas, 2001). Entrepreneurs were asked to indicate the extent of their agreement with each of the items; how strongly they agree or disagree with the statement on a fifth level Likert's scale (1974). Eight items comprise the Innovativeness (Table 1) scale.

Entrepreneurial Curiosity measure Jeraj (2014) was composed from the Pre-Entrepreneurial curiosity and Entrepreneurial curiosity measure. Entrepreneurs had to indicate for each of the statements related to entrepreneurial curiosity how often does a particular activity occur in their life by circling the number of frequency of the occurrence from "1" - the activity never occurs to "7" - it always occurs for first three items and how strongly they personally agree or disagree with the statement. "1" indicated that they strongly disagree, and "7" indicated that they strongly agree with the statement for the last four items. According to factor analysis the lowest factor loading in Entrepreneurial curiosity measure (Table 2) was just above 0.4 and the highest factor loading was 0.8.

6 Results

Exploratory factor analysis (EFA) is used to "identify the factor structure or model for a set of variables" (Bandalos, 1996). Exploratory factor analysis was conducted for both, the Slovenian sample and the US sample together. In terms of factors, the results of the factor analysis were similar for the Slovenian and USA samples.

Structural equation modeling (SEM) provides a way to test the specified set of relationships among observed and latent variables as a whole, and allow theory testing even when experiments are not possible (Savalei and Bentler, 2010). Structural equation modeling was made by building a model in Lisrel 8.80, which is an analytical statistics program. Results of structural equation modeling based on the joint sample from Slovenia and USA (n=331) are displayed in Figure 1.

For the purpose of estimating results of multi-country empirical validation was used a combination of exploratory (EFA) and confirmatory methods (CFA – all the variables were included to the structural equation model) with the goal to develop a model which complement theoretical

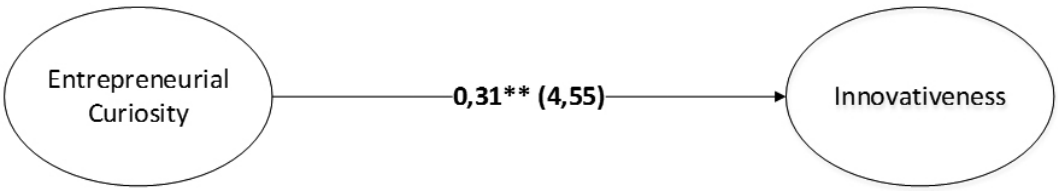

Figure 1: Standardized solution of the tested model and the T-values for the tested model

predisposition and fit the data. Confirmatory factor analysis (CFA) is generally used to test theory when the analyst has sufficiently strong rationale regarding what factors should be in the data and what variables should define each factor (Henson and Roberts, 2006).

According to the results from Figure 1 higher levels of entrepreneurial curiosity lead to higher levels of innovativeness; influence is moderate (0.31), positive and statistically significant (t = 4.55). This finding is in support of our hypothesis. The fit indices of the structural equation model present a good model fit, which is indicated by the values of $\chi 2$ = 371,44; df = 118; $\chi 2$/df = 3,1478; and RMSEA = 0.081. The hypothesis was defined to test the relation between the constructs in this model; the relation show a statistical significance according to the t-test values whereas the whole model shows statistical significance of P-value = 0.0000.

7 Discussion

An entrepreneur is the most important part of the whole entrepreneurship process. Entrepreneurs who are aware of being more innovative than other members of the same social system (e.g., other entrepreneurs) and count upon their innovativeness to face competition should re-organize their firms (Marcati, 2008). Since entrepreneurs with higher levels of entrepreneurial curiosity gather more data and knowledge, they should transform this base of applicable knowledge with innovativeness to better results of their companies.

Innovation is a broad term with multiple meanings; it draws on theories from a variety of disciplines and has been studied using a wide range of research methodologies (Crossan and Apaydin, 2010). In this research, the innovativeness is seen as the ability of entrepreneur to understand the meaning of the change and adaption. Thus, in relation with entrepreneurial curiosity an entrepreneur is capable to, not only understand but to incorporate innovativeness into the processes, business models and raise the level of innovativeness in whole organization. Since today, the change is the only constant entrepreneurs with high levels of entrepreneurial curiosity and innovativeness could be successful on the market by launching new products or services, explore and penetrate new markets and confront with the challenges on the global market competition.

The results of this study indicate that at the frame of entrepreneurship psychology entrepreneurial curiosity is important for innovativeness. This result is not surprising since already Price and Ridgway (1983) argued curiosity is one of the main components of the innovativeness.

8 Contribution, implications for theory, research, practice and economic policy

This study has some important implications for the literature of entrepreneurship. The ability to be innovative represents to entrepreneurs and their companies a relative advantage in relation to entrepreneurs that lack innovativeness. Baron and Tang (2011) argued relatively little direct evidence exists concerning mechanisms through which individual entrepreneurs encourage innovation in their companies. This paper presents the platform to identify entrepreneurs with higher level of entrepreneurial curiosity and innovativeness.

A primary implication of this paper is to facilitate future research on the field of entrepreneurship and more specifically on the field of entrepreneurial curiosity and innovativeness. The contribution of this paper is manifold. From the practical view of contribution policy makers can test individuals according to their level of entrepreneurial curiosity and innovativeness. Since both constructs have been linked to company's growth in the past it is logical to conclude that investing public money to certain nascent entrepreneurial actors who are identified as high on entrepreneurial curiosity and innovativeness level. A nascent entrepreneur is defined as a person who is now trying to start a new business, who expects to be the owner or part owner of the new firm, who has been active in trying to start the new firm in the past 12 months and whose start-up did not yet have a positive monthly cash flow that covers expenses and the owner-manager salaries for more than three month (Wagner, 2005). Another contribution of this paper from the practical view is ability of entrepreneurs to test employees. Those with higher levels of investigated constructs should be encouraged to the tasks demanding higher level of knowledge, inventiveness, and innovativeness.

From the theoretical side I can argue that a literature gap on the field of entrepreneurial curiosity connected with innovativeness if fulfill. The structural equation model presented in this paper is the first model integrating these constructs and show that entrepreneurial curiosity positively influences innovativeness. Researchers will be able to test individuals in different countries and compare results with this study. Researchers will be able to test youth and transfer more entrepreneurial curious and innovative students to educational process that can offer them knowledge appropriate for entrepreneurship. According to that, this paper not just promotes entrepreneurship among youth but also stimulating youth to become active in entrepreneurship.

9 Limitations and future research opportunities

Although this research makes several important contributions, implications for theory, research, practice and economic policy, current results and conclusions regarding to impact on results of the enterprises are evaluated only within the theoretical frame. Based on the fact that this study has only theoretical implications for the growth of the company and consequently growth of the GDP regarding to entrepreneurial curiosity and innovativeness, future study should research the link to firm's growth in order to have an empirical conformation of that theoretical predisposition.

Another potential limitation of this study does not represent a problem for interpretation of the results, more it indicates opportunities for future research. For instance, the fact that the data were gathered among entrepreneurs in Slovenia and USA can indicate limitation, since it is not necessary that results would be equal in some Asian of African countries. Another research should include also entrepreneurs from those countries and also separate analysis for each country or groups of people depending on their demographics.

Psychological research of entrepreneurship has focused primarily on the founders - entrepreneurs rather than on employees of the organizations. Since also employees are important for the growth of the company and the fact that employees can be more entrepreneurial curious and innovative than the founders it would be interesting to develop new research addressing them and gather the data from that sample and thus compare the results with the results of entrepreneurs.

Entrepreneurial activity is recognized as a fundamental constituent of technological progress, business expansion, wealth creation and is considered as a major contributor to new job creation (Parker, 2004). Beside entrepreneurial curiosity and innovativeness also other factors influence the results of the company. Future study should include other factors not captured by the current research to develop a model with more constructs.

10 Conclusion

The findings of this study suggest that entrepreneurial curiosity and innovativeness are connected. Innovations by entrepreneurs tip the balance in the economy and lead to a process of creative destruction, via which firms that do not adopt the new technologies disappear (Soriano and Huarng, 2013). According to that, entrepreneurs should invent in their companies and stimulate innovative behavior among employees.

As indicated by these results, it seems that entrepreneurial curiosity and innovativeness are important constructs to forecast the growth of the company. Previous studies have focused primarily on the relations between entrepreneurial curiosity and other constructs (entrepreneurial self-efficacy, openness, firm growth) and innovativeness and other constructs (creativity, leadership, firm growth). This paper filled the literature gap on the related field of studied constructs and presents an important contribution for entrepreneurship theory.

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Empirična raziskava povezanosti med podjetniško radovednostjo in inovativnostjo

Ozadje in namen: Kljub akademskemu zanimanju za razumevanje vlog različnih dejavnikov na podjetnike in njihovo vedenje, je malo znanega o povezanosti med podjetniško radovednostjo in inovativnostjo. Ta raziskava raziskuje povezanost med podjetniško radovednostjo, ki motivira podjetnike za zbiranje informacij o svojem poslovanju in inovativnosti, ki motivira podjetnike k vključitvi inovacij v podjetniške procese.
Oblikovanje / Metodologija / Pristop: Udeleženci v tej raziskavi, so bili podjetniki iz Slovenije in ZDA. Z uporabo modeliranja strukturnih enačb smo povezali dva konstrukta, podjetniško radovednost in inovativnost za preverjanje vpliva.
Rezultati: Rezultati prikažejo, da podjetniška radovednost pozitivno vpliva na inovativnost. Rezultati te raziskave prikažejo, da je v okviru podjetniške psihologije podjetniška radovednost pomembna za inovativnost.
Zaključek: Članek povezuje dva preučevana konstrukta in predstavlja dragocen prispevek za teorijo podjetništva; zato se lahko rezultati uporabijo za nadaljnje znanstvene raziskave, kakor tudi za praktične implikacije.

Ključne besede: *podjetniška radovednost; inovativnost; podjetje; podjetništvo; podjetnik*

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Differences between National Cultures Matter – Case of Slovenian-Korean Working Environment

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Aims: Global business today usually requires organizations to be present locally in countries where their customers are. To do this successfully, good cooperation with local people is needed. Therefore, this paper focuses on the integration of cultures in the business world. The insights from this study are expected to benefit Slovenian expatriates to foreign companies in South Korea, as well as national culture researchers. The main goals of this research include a comparison of Hofstede's IBM survey results with the researched working environment, and identifying the benefits of merging two national cultures for the working environment.
Methods: A questionnaire was distributed to purposive samples within the researched working environments and the collected data analysed used SPSS, where the hypotheses were tested using a chi-square test and t-test for independent samples.
Results: The results revealed significant differences between the two national cultures in the working environment, e.g.: fear of expressing disagreement towards superiors, commitment to work, preference of challenges, tendency to avoid conflicts and innovations – all differed according to nationality.
Conclusion: Working together with people from different cultures requires a certain amount of adaptation (learning about another culture, expecting situations that are not usual). If this adaptation is successful, then cooperation between the different cultures can also be successful, leading to a potential output that is even better than cooperation between people from the same culture.

Keywords: *organizational behaviour, national culture, organizational culture, working environment, South Korea, Slovenia*

1 Introduction

Globalization is now a popular term, as advancements in modern technology and travel have provided access to practically all countries and a heightened awareness of every race and ethnic affiliation. The following definition of globalization has been proposed by Al-Rodhan and Stoudmann (2006, p. 5): "Globalization is a process that encompasses the causes, course, and consequences of transnational and transcultural integration of human and non-human activities."

Every country is unique in its own way, it has its own national culture, values, habits, and way of life. The consequence of globalization is interaction between these various national cultures. Storti (2007) says that, in most cases, when in a new culture, people seek to adapt themselves, yet not all are successful. He continues that cultural adaptation is a phrase that refers to the process of

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learning a new culture and its behaviours and language in an effort to understand and empathise with the people of the culture and to live and interact successfully with them. Hofstede, Hofstede and Minkov (2010) emphasise cultural relativism – it calls for suspending judgement when dealing with groups or societies different from one's own and how we should think twice before applying the norms of one person, group, or society to another. Johns and Saks (2008) mention an example of how perception, attribution, and judgement of others impact one's position in an organization and how avoidance of premature judgement can prevent this. In real life, we believe we know the typical characteristics and through studies of different experts (e.g. Hofstede's IBM research, which was, according to Hofstede (2001) conducted around 1968 and 1972) even the habits and behaviour of nations, yet sometimes we also lean on stereotypes, and stereotypes are, according to Hofstede (2001), at best half-truths. Rather, it is actual international interaction that shows us how much we really know about others. A successful international relationship is in fact very fragile, and depends on how we handle even the smallest, seemingly unimportant details. The harshest consequence of mishandling details can even lead to war, which is actually surprisingly common. When we visit a foreign country without educating ourselves about its culture first, we can find ourselves constantly in conflict with the locals. "When two people from different cultures meet, they rely on their past experiences and judgment to decide which communication is appropriate. However, if the two have conflicting needs, it is important to focus on what initially seems to be inappropriate communication" (Merkin, 2015, para. 18).

Organizations exist in every culture, and these organizations vary from the family to huge business enterprises. How these organizations function is based on the national culture, yet to keep functioning well when expanding across a national border can be a challenge. According to Hofstede (ITAP International, n. d.), what is often overlooked or at least underestimated when two or more companies merge/integrate is how the underlying personal values of the employees impact on the perception of the corporate culture change efforts. Adaptation to processes and priorities is something a person can learn, and following the exemplar behaviour of leaders in an organization is something a person can be persuaded to do. However, a problem occurs if these priorities and the leadership traits go against the deeply held national cultural values of the employees, as then the corporate values (processes and practices) will be undermined. It has also been shown that what is appropriate in one national setting is wholly offensive in another, and what is rational in one national setting is wholly irrational in another. Corporate culture never trumps national culture. "It needs to be taken under consideration, that an attempt of integration of very remote and culturally different units into an effective unit is a great challenge" (Treven, 2001, p. 19). Treven (2001) also states that it is very important for managers in a global economy to understand and recognize the effect different cultures have on organizational behaviour, because national values, behaviour, tradition, customs, and ideology create recognition of organizational structure, culture, and dynamics. She also says that for organizations that face an outside environment, this environment is more complex, dynamic, and competitive than the local one, so, in order to perform successfully in it, they have to know other cultures and behaviour in their organizations.

This paper presents part of a wider research conducted in 2015. The purpose of the research was to explore Slovenian-Korean interactions. However, this paper focuses on intercultural integration in the business world, which may be valuable for expatriates working for foreign companies in South Korea, and for researchers of national cultures in the working environment. The two main goals of the research were: (i) to compare Hofstede's 1968 and 1972 IBM survey results (Hofstede, 2001) with our researched working environment, and (ii) to determine if merging the characteristics of two national cultures can be helpful within a working environment. The paper is organized in five sections: the introduction is followed by a literature review, the third section describes the methodology of the research, and the last two sections present the results and discussion with conclusions.

2 Literature review

The topic of national cultures and their impact on organizational culture is mainly studied within organizational behaviour. According to Robbins and Judge (2013), organizational behaviour is an applied behavioural science built on contributions from a number of behavioural disciplines, e. g. psychology and social psychology, sociology, and anthropology. Psychology's contributions have been mainly at the individual or micro level of analysis, while the other disciplines have contributed to our understanding of macro concepts, such as group processes and organization. Johns and Saks (2008) simplify organizational behaviour as the attitudes and behaviours of individuals and groups in an organization. Meanwhile, Treven (2001) writes that principles of organizational behaviour play an important role in assessing and increasing organizational effectiveness and that we can take this as a primary task for which all managers in organisations are responsible for.

Now add an international aspect to organizational behaviour: "Although all members in organizations are human beings, individuals working with different cultures and nationalities experience diverse difficulties that cannot be assumed as similar to those individuals working in a homogenous setting" (Dolan and Lingham, 2012, p. 19). But,

what is culture exactly? According to Završnik and Miglič (2010), the word culture comes from the Latin word »colere« and means construction, fostering, and nursing. It means people acting based on traditions and general behaviour patterns, so culture is a summary of history, knowledge, experience, beliefs, comprehension, customs, valuations, time, and space valuations. Culture is unwritten rules followed by a certain group of people. According to Hofstede (2001), cultures are not king-size individuals but wholes, and their internal logic cannot be understood in the terms used for the personality dynamics of individuals. Hofstede, Hofstede and Minkov (2010) associate culture with mental software and such mental programs vary as much as the social environments in which they were acquired. They continue by marking culture as a collective phenomenon, because it is at least partly shared with people who live or lived within the same social environment where it was learned. Further, they explain that regional, ethnic, and religious cultures account for differences within countries, while ethnic and religious groups are often not limited to country borders.

Hofstede, Hofstede and Minkov (2010) also define four dimensions of national cultures: power distance, collectivism versus individualism, femininity versus masculinity, and uncertainty avoidance. The power distance represents the extent of the acceptance of unequally distributed power, where countries with a high power distance have a pronounced superior authority. In such countries, management by objectives (MBO) does not work, simply because it presupposes some kind of negotiation between superiors and subordinates. Meanwhile, in low power distance countries, there is a certain equality between superiors and subordinates, thus the hierarchical system is flat and roles are sometimes reversed. Collectivism versus individualism relates to the prevalence of the interests of groups or individuals. "Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after him- or herself and his or her immediate family. Collectivism as its opposite pertains to societies in which people from birth onward are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty (Hofstede, Hofstede and Minkov, 2010, p. 92)." Femininity versus masculinity means whether genders have clearly distinct emotional roles or not. Along with masculinity and femininity, Hofstede, Hofstede and Minkov (2010) also describe two other characteristics, assertiveness and modesty. Masculinity and femininity is relative, males can act feminine, as well as females can act masculine, however the general trend is that males should be more occupied with achievements away from home (traditionally hunting and fighting), while females are supposed to take care of the home and family. Finally, uncertainty avoidance is whether society tends to avoid everything that is different or is accepting it. According to Hofstede, Hofstede and Minkov (2010), the term "uncertainty avoidance" was provided by Mr. James G. March. The researchers also state that ways of handling uncertainty are part of any human institution in any country. They add that all human beings have to face the fact that what will happen tomorrow is unknown: the future is uncertain, but we have to live with it anyway. Additionally, they say that uncertainty is a subjective experience, a feeling. Uncertainty avoidance can also be explained by an example of two different situations – most of us would feel uncomfortable jumping off a bridge with a bungee rope, despite knowing the rope will hold us, whereas we would have no issue riding a mountain bike through the woods, even though the latter situation is more likely to lead to serious injury. Hofstede, Hofstede and Minkov (2010) say a dimension is an aspect of culture that can be measured relative to other cultures. However, organizational cultures are, according to Hofstede, Hofstede and Minkov (2010, p. 47), a phenomenon by themselves, different from national cultures in many respects. They say an organization is a different social system from a nation as the members usually did not grow up in it, but had a certain influence on their decision to join it, are involved in it only during working hours, and will one day leave it. Plus, a further comment was made that research on national cultures and their dimensions proved to be only partly useful for understanding organizational cultures.

According to the Hofstede Centre (2014a), the cultural characteristics of a Slovenian are:

- rather satisfied with a strong hierarchical society, recognizes advantage to their superiors and elders, and likes to see their superiors as more important and outstanding compared to their neighbours' superiors;
- integrated into a strong group that takes care of them and they strongly depend on, does not appreciate new challenges, personal time and freedom, but gives absolute advantage to perfecting of existing knowledge and to good working environment conditions;
- prone to feminine values – cooperation, harmony, security;
- has a great desire for an environment that is regulated with rules, resists innovations, is punctual, always busy and motivated to work hard;
- not particularly focused on the future, nor past or present time;
- not particularly spoiled nor retained.

Maybe these characteristics do not seem right, because some conclusions are totally opposite from the actual situation in Slovenia. However, some additional explanations are needed, especially for individualism/collectivism, where Slovenia scores more as a collectivist country, despite considering ourselves as an individualistic country. Treven (2001) characterizes Slovenians as individualists, while Hofstede, Hofstede and Minkov (2010) found in their summary of Minkov's research from 2007 that Slo-

venia is somewhat special. Minkov added 2 poles, exclusionism and universalism, where Hofstede, Hofstede and Minkov (2010) defined exclusionism as a cultural tendency of treating people based on their connections with the group and reservations of favours for groups with which one identifies, and excluding all outsiders. Universalism on the other hand is the opposite tendency: to treat people based on who they are as individuals, not which group they are affiliated to. Within these poles Hofstede, Hofstede and Minkov (2010) put Slovenia among universalists. This is contrary to the previously defined character assumptions, and means Slovenians are actually much more open to outside people, as expected. When it comes to attitude towards work, we found from Slovenia partner (n. d.) that Slovenians are prone to separating their personal and business life, which consequently leads to more time available to spend with their families. On the Slovenian business portal and their Centre for international cooperation and development (2013), data identifies Slovenia as an »innovation follower« with innovations averaging above or close to the EU average and constantly growing. This fact alone is in complete contradiction to the general statement above for countries with a high uncertainty index, where resisting innovation is stated as one of the cultural characteristics for a Slovenian.

According to the Hofstede Centre (2014b), the cultural characteristics of a South Korean are:

- rather satisfied with a strong hierarchical society, recognizes advantage to their superiors and elders, and likes to see their superiors as more important and outstanding than their neighbours' superiors;
- integrated into a strong group that takes care of them and they strongly depend on, does not appreciate new challenges, personal time and freedom, but gives absolute advantage to perfecting existing knowledge and to good working environment conditions;
- prone to feminine values – cooperation, harmony, security;
- has a great desire for an environment that is regulated with rules, resists innovations, is punctual, always busy and motivated to work hard;
- totally dedicated to working for the future;
- retained and pessimistic.

There is a significant influence of Confucianism, which has, according to Coyner and Jang (2010), despite the fact that it originates from China, made its mark in Korea more than anywhere else, and so we can find reasons for all Korean values in Confucianism. As Coyner and Jang (2010) presented, the code and rules of Confucianism determine the loyalties, obligations, and responsibilities between the ruler and the subject, parent and child, young and old, and between friends and the rest. Coyner and Jang (2010) say that in South Korea, hard work and dedication to an organization is regarded as a virtue. Anyone not in conformity with this value system is not accepted, sometimes even by their wife. Essentially, a wife finds it difficult to understand when her husband comes home sooner than her neighbour's husband, as this implies that the neighbour's husband has more important business activities than her husband. She wants to boast of the importance of her husband, even if it means working late hours. When it comes to rules, Kim Hoo-ran (2014) explains that there are many rules in Korea, yet people disregard them, which often has fatal consequences. This is attributed to the "ppalli ppalli" or "hurry hurry" culture, which is a by-product of the era which saw economic development as the overarching goal. In such a culture, decades were spent circumventing laws for the sake of reaching goals, thereby becoming insensitive to potential danger.

3 Methodology

"To work effectively with people from different cultures, you need to understand how their culture, geography, and religion have shaped them and how to adapt your management style to their differences" (Robbins and Judge, 2013, p. 17). The current research was conducted in 2015 using an anonymous survey within working environments. We studied whether in a mixed Slovenian-Korean working environment the indices of the researched dimensions on national culture for both nations remained in line with the results of Hofstede's IBM 1968 and 1972 surveys (Hofstede, 2001). As a result, people interested in a mixed working environment can have a good starting point to choose the right approach for coordinating these two cultures. Kolektor has existed for more than 50 years (Kolektor, n. d.), during which time it developed into a global company with its headquarters in Slovenia and companies in Europe, America, and Asia. The product portfolio ranges from components and systems for the automotive industry to energetics and industrial technologies. Treven (2001) says that managers in such companies must know the culture and other economics, social, and technological characteristics of the country in which production is set. This claim gave us the foundation for conducting research within Kolektor, as till now no such specific research has been done.

Kolektor in Slovenia consists of several companies scattered across the country, with a total of 2244 employees at the end of June 2015. Meanwhile, the Kolektor Sinyung Company in South Korea employed a total of 119 Koreans and 3 Slovenians at the end of June 2015. The origins of the Korean company go back to 1978, when it was started as a joint venture of Korean and Japanese investors with the intention of producing commutators. In 2000, the company was acquired by Kolektor, the revenues have since multiplied more than five times. The product portfolio consists entirely of components for the automotive industry.

The aim of this study was to answer the following research questions:
RQ1: Are the working habits between the two cultures within the working environment different?
RQ2: Can the characteristics of the two different cultures be merged in a positive way?

More precisely, according to the research aims, several research hypotheses were investigated within each cultural dimension:

Power distance:
RH1: The expectations of the employees as regards their manager are related to the nationality of the employee.
RH2: The fear of expressing disagreement to a superior differs according to the nationality of the employee and manager.

Individualism/collectivism:
RH3: On average, Korean employees have a higher work commitment than Slovenian employees.
RH4: The approach to work is related to nationality.

Masculinity/femininity:
RH5: Avoiding conflict situations is related to nationality.
Uncertainty avoidance:
RH6: Uncertainty avoidance is related to nationality.

Population and sample
As emphasized in the article title, the population was strictly limited to employees of the Kolektor Company in two locations, Korea and Slovenia, since we investigated the aspect of uncertainty avoidance between Slovenian and Korean cultures. A purposive sample was used, where the criterion for inviting employees to participate in the research was previous experience with the other culture (i.e. Slovenian or Korean) within the working environment.

Development of instrument and data sources
The questionnaire was based on Hofstede's questionnaire (Hofstede, 2001, p. 467 - 474), from where the following questions were adopted, some with exact wording, while others with some modifications. The socio-demographic characteristics included: marital status, length of employment by current company, estimated period of future employment for the company, educational status, and age. The questionnaire also included preferences and actual type of managers/superiors. In addition to the listed adopted questions, the following socio-demographic characteristics were also included: gender and position in the company. Plus, questions on fear of disagreement with a manager, reprimand effectiveness, preferred way of solving assignments and problems, acceptance of late working hours and breaking holidays due to work reasons, preferred renewal of old or build new machines, preferred type of ideas, importance of profit or growth, and requested holidays were specifically created for this research. Respondents were also asked to describe their experience in the other location (for Koreans this was Slovenia and vice versa). The questionnaire was prepared as an instrument for broader research, therefore, this study only deals with the results related to the dimensions covering nationality. The questionnaire was anonymous and no benefits were given to respondents who completed it.

Data collection procedures

In Slovenia, an online version of the questionnaire was distributed in Slovenian language, while in Korea, the questionnaires were handed out personally in a printed form in Korean language. The questionnaire was initially written in Slovenian, and then translated into English and finally into Korean with the help of a Korean manager. The questionnaires completed in Korean were translated into English by the same Korean manager.

The research sample consisted of two groups according to the location, but not limited to nationality (there is a possibility for a foreign respondent within the location group). The actual sample sizes were 71 respondents in Korea (representing 60% of the total employees in Korea) and 54 respondents in Slovenia (representing 2.4% of the total employees in Slovenia). Altogether, the analyses included 125 completed questionnaires. The analyses of the gathered data were performed using SPSS (Statistical Package for Social Sciences), where different statistical methods were used: chi-square test and t-test for independent samples.

4 Results

The participant profile is presented first, followed by the results of the six research hypotheses within the four dimensions of culture.

Participant profile
The participant profile is presented based on the general demographic characteristics. Among the 125 questionnaire respondents, 93 were men (56 of whom were Korean) and 32 were women (12 of whom were Korean). 29 Slovenians and 41 Koreans were married and the majority (49) were aged 31 – 40 years (40 were aged 41 – 50 years, 28 were younger than 31 years, and 8 were aged 51 years or over). Most of the participants were also well educated: 5 had graduate degrees - Master's or Ph.D. (4 Slovenians and 1 Korean), 62 had undergraduate degrees (29 Slovenians and 33 Koreans), 45 had high school diplomas (12 Slovenians and 33 Koreans), and only 13 had completed secondary school (12 Slovenians and 1 Korean). However, most participants (50) worked as operators or technologists in production (11 Slovenians and 39 Koreans), 44 worked as

engineers or administrative workers (24 Slovenians and 20 Koreans), 21 worked as managers or team leaders (12 Slovenians and 9 Koreans), and 10 worked in management (all Slovenians).

Analyses of research hypotheses

4.1.1 Power distance

For the first research hypothesis, we investigated whether the expectations of the employees about their manager were related to the nationality of the employee. The expectations of the employees about their manager were measured using a description of four types of manager according to Hofstede's research (2010). The respondents were asked to select one of the four manager types. The descriptions are shown in Table 1, along with a contingency table of the preferred manager type according to the nationality of the employee.

The hypothesis was tested using a chi-square test. As shown, that Slovenian respondents preferred manager 3 (63%), and least preferred manager 1 (2%). Meanwhile, the Korean respondents preferred manager 2 (44%), followed by manager 4 (27%), and only then manager 3 (18%). Interestingly, in contrast to the Slovenian respondents, 8 Koreans (12%) preferred to work with manager 1.

Since the expected count was lower than 5 in two fields of the contingency table, Fischer's exact test was applied. The p-value was 0.000 < 0.05, meaning that a null hypothesis, where the variables are not related, can be rejected at a 5% significance level. As a result, the first research hypothesis was confirmed, the manager type preference was found to be related to the nationality of the employee.

The second research hypothesis (RH2) »Fear of expressing disagreement toward a superiors differs according to the nationality of the employee and manager« was divided into 2 parts:

H2a: Average fear of expressing disagreement toward a superior differs according to nationality of employee.

H2b: Average fear of expressing disagreement toward a superior differs according to nationality of manager.

Both hypotheses were tested using a t-test for independent samples. The question about fear of expressing disagreement towards superiors was answered on a 5-point scale of frequency: 1 – very often, 2 – often, 3 – sometimes, 4 – rarely, and 5 – never. The average response for the Korean respondents was »rarely« (4.01, s = 1.029), whereas the Slovenian respondents showed more fear of expressing disagreement to a superior as the average response was classified as »sometimes« (3.42, s = 1.034).

First, the results of hypothesis H2a are presented. Since the p-value for the Levene test of variance equality was 0.347 > 0.05, this means that our null hypothesis of equality of variance could not be rejected at a 5 % significance level. The t-test p-value was 0.002 < 0.005, which means that the null hypothesis abouth the equality of the average frequency of fear could be rejected at a 5 % significance level (Table 2). Therefore, the average fear of expressing

Table 1: Preferred manager type according to nationality of employee

		Nationality of employee	
		Slovenian	**Korean**
Manager 1: Usually makes decisions promptly and communicates them to subordinates clearly and firmly. Expects subordinates to carry out the decisions loyally and without raising difficulties.	Count	1	8
	Expected Count	4.1	4.9
	% within preferred manager type	11.10%	88.90%
Manager 2: Usually makes decisions promptly, but, before going ahead, tries to explain them fully to subordinates. Gives reasons for the decisions and answers whatever questions subordinates may have.	Count	12	30
	Expected Count	19	23
	% within preferred manager type	28.60%	71.40%
Manager 3: Usually consults with subordinates before reaching a decison. Listens to advice, considers it, and then announces the decision. Expects all to work loyally to implement decision whether or not it is in accordance with the advice given.	Count	35	12
	Expected Count	21.2	25.8
	% within preferred manager type	74.50%	25.50%
Manager 4: Usually calls meeting of subordinates when there is an important decision to be made. Puts the problem before the group and invites discussion. Accepts the majority viewpoint as the decision.	Count	8	18
	Expected Count	11.7	14.3
	% within preferred manager type	30.80%	69.20%

Table 2: Descriptive statistics and results of corresponding t-tests for frequency of fear of expressing disagreement toward a superior according to nationality of employee and superior, respectively

Test of hypothesis	Nationality	Descriptive statistics				Levene's Test		t-test for Equality of Means		
		N	Mean	Std. Deviation	Std. Error Mean	F	Sig.	t	Df	Sig. (2-tailed)
H2a: Nationality of employee	Slovenian	57	3.42	1.034	0.137	0.891	0.347	-3.205	123	0.002
	Korean	68	4.01	1.029	0.125					
H2b: Nationality of superior	Slovenian	58	3.41	1.027	0.135	0.766	0.383	-3.341	123	0.001
	Korean	67	4.03	1.029	0.126					

disagreement toward a superior was different according to the nationality of the employee at a 5 % significance level.

Second, the results of hypothesis H2b are as follows. The respondents with a Slovenian manager showed a higher frequency of fear towards expressing disagreement (3.41) than the respondents with a Korean manager (4.03).

Based on the p-value from Levene's test 0.383 > 0.05, the null hypothesis of equality of variance could not be rejected at a 5 % significance level. The t-test p-value was 0.001 < 0.05, which means that the null hypothesis about the average equality of the frequency of fear towards expressing disagreement could be rejected at a 5 % significance level. Thus, the frequency of fear of expressing disagreement towards superiors was found to differ according to the nationality of the manager. Therefore, the second research hypothesis that "Fear of expressing disagreement towards superiors differs according to the nationality of the employee and manager" was confirmed.

4.1.2 Individualism/Collectivism

The two hypotheses, RH3 and RH4, are related to the dimension of individualism and collectivism.

The third research hypothesis (RH3) assumes that work commitment is related to the nationality of the employee. Commitment to work was measured using two variables, thus dividing the hypothesis into:

H3a: Acceptability of overtime work is related to nationality of employee

H3b: Acceptabiltiy of vacation interruption due to an important projectis related to nationality of employee

The respondents evaluated if two situations seemed, and to what extent, acceptable to them. Both acceptability of overtime work as well as acceptability of a vacation interruption due to an important project were evaluated on a 5-point acceptability scale ranging from 1 – 'totally acceptable, the company needs me', 2 – 'difficult, but acceptable since the company needs me', 3 – 'not acceptable, but also not unacceptable', 4 – 'unacceptable, but in an urgent case I am prepared to make an exception', and 5 – 'totally unacceptable'. The hypothesis was tested using an independent samples t-test.

The results showed:

- in the case of overtime acceptability, both Slovenians and Koreans answered on average almost the same (1.86 for Slovenian and 1.84 for Korean respondents).
- in the case of acceptability of vacation interruption due to an important project, the Slovenian respondents had an average of 2.67, while the Korean respondents evaluated the statement with an average equal to 2.31, which means that, on average, the respondents answered between »difficult, but acceptable since the company needs me« and »not acceptable, but also not unacceptable«.

The results of the t-test for statistical hypotheses H3a and H3b are presented below.

- Acceptability of overtime work. In this case, Levene's test p-value was 0.201 > 0.05, so we cannot reject our assumption about the equality of variances at a 5% significance level. The one-sided t-test p-value was equal to 0.448 (0.896 / 2 > 0.05), meaning that the null hypothesis about the average acceptability of overtime work between Korean and Slovenian employees could not be rejected at a 5 % significance level.
- Acceptability of vacation interruption due to an important project. Levene's test p-value was 0.016 < 0.05, therefore the null hypothesis about the equality of variance could be rejected at a 5% significance level. The one-sided t-test p-value was 0.045 (0.089 / 2 < 0.05), therefore the null hypothesis about the average acceptability of vacation interruption due to an important project could be rejected at a 5% significance level. On average, the Korean employees found a vacation interruption due to an important project more acceptable than the Slovenian employees.

Therefore, our third research hypothesis was partially confirmed; Koreans are more committed to work when it comes to vacation interruption, yet in the case of overtime

work, there were no statistically significant differences at a 5% significance level.

The fourth research hypothesis assumes that the approach to work is related to nationality and was split into two parts:
RH4a: Way of resolving tasks is related to nationality of employee.
RH4b: Preferred kind of work is related to nationality of employee.

To test the above hypotheses, we used chi-square tests and the results regarding the way of resolving tasks were as follows. Among the Slovenian respondents, 44% preferred solving tasks individually, while 56% preferred team work. Among the Korean respondents, the situation was quite similar with a ratio of 43: 57% in favour of solving tasks individually.

The chi-square p-value was equal $0.892 > 0.05$, indicating that our null hypothesis that the preferred way of task solving and nationality are not related could not be rejected at a 5% significance level. This leads to the conclusion that the way of resolving tasks was not related to the nationality of the employee. However, when we compared the preferred kind of work and the employee's nationality, we found that the Slovenian respondents mostly (91%) preferred work that is full of challenges, while among the Korean respondents, only 46% preferred this type of work.

The chi-square test p-value for RH4b was equal to $0.000 < 0.05$, meaning that the null hypothesis, that the preferred kind of work and nationality are not related, could be rejected at a 5% significance level.

Therefore, based on the test results, RH4 was only partially confirmed – we found a clear association between the employee's nationality and the preferred kind of work (whether challenges are preferred or not), yet no significant difference associating nationality and the way of resolving tasks.

4.1.3 Masculinity/Femininity

To test the fifth research hypothesis, that avoiding conflict situations is related to nationality, a chi-square test was used.

The method of problem solving was measured through options: whether ideal or compromise solutions were preferred. It was found that 37% of the Slovenian respondents preferred an ideal solution, while 63% preferred a compromise. Meanwhile, for the Korean respondents, the percentage in favour of an ideal solution was much lower, only 15%.

Based on the p-value of the chi-square test, which was $0.004 < 0.05$, our null hypothesis, that there is no relationship between the method of problem solving and nationality, could be rejected at a 5% significance level. Thus, we confirmed our assumption that Koreans tend to prefer compromise solutions.

Therefore, based on the above results, the fifth research hypothesis »Avoiding conflict situations is linked to nationality« was fully confirmed.

4.1.4 Uncertainty avoidance

For the sixth research hypothesis, that uncertainty avoidance is related to nationality, this was measured using two concepts: rebuilding/changing machines and type of ideas used. The corresponding hypothesis were as follows:
RH6a: Preferred way of rebuilding/changing machines is related to nationality of employee.
RH6b: Preferred type of ideas used is related to nationality of employee.

The preferred way of rebuilding/changing machines was measured based on the respondents' opinion of what type of new machine they preferred; a totally new machine (which is cheaper, with better productivity, yet untested and with a questionable reliability) or an already tested design (not better in any way except guaranteed reliability).

For the preferred type of ideas used, two possibilities were also given, a new idea (with big potential, yet untested, so it could fail totally in practice) or a tested idea (which would mean higher costs, but an already proven success rate).

The results showed that, among the Slovenian respondents, 58% preferred to use a totally new machine, while 42% preferred to use a tested design. For the Korean respondents, the situation was reversed – fewer Koreans favoured using a new machine (22%), while more preferred a tested design (78%).

The chi-square test p-value for RH6a was $0.000 < 0.05$, indicating that the null hypothesis, that there is no relationship between the preferred way of rebuilding/changing machines and the nationality of the employees, could be rejected at a 5% significance level. We also confirmed that Koreans prefer reliable and tested machines or systems.

As regards the preferred type of ideas used, the results showed that the Slovenian respondents were quite balanced, yet still more in favour of tested ideas (ratio 47 : 53%), whereas the Korean respondents showed a much clearer tendency to use tested ideas (74%).

The chi-square test p-value at RH6b was $0.015 < 0.05$, therefore our null hypothesis, that there is no relationship between the preferred type of ideas used and the nationality of the employees, could be rejected at a 5 % significance level. Plus, this confirmed that Koreans prefer reliable and tested ideas. Thus, the sixth research hypothesis »Uncertainty avoidance is related to nationality« was fully confirmed.

5 Discussion

This research addressed the topic of intercultural differences according to Hofstede's research, yet in this case translated to the specific working environment of Kolektor Sinyung. The main focus was comparing the dimensions of culture with the nationalities involved within this working environment – Korean and Slovenian. The goal was to provide as much information to the responsible director, as well as to any interested parties where such research of two cultures in a working environment could be useful.

The current results confirmed our assumptions that, for all the dimensions of culture, a relationship existed between certain variables (expectations of employees about their manager, fear of expressing disagreement towards superiors, work commitment , approach towards work, avoiding conflict situations, uncertainty avoidance) and nationality. The only exceptions were overtime work and the way of resolving tasks, both of which are part of the individualists/collectivists dimension, however, we still achieved partial confirmation. Thus, the differences between cultures were identified. Facts:

- Korean employees prefer more authoritative managers, yet seem to have less fear of expressing their mind to their managers than Slovenian employees;
- Koreans are more committed to work;
- Koreans do not like to create conflicts and thus prefer compromise where there is no winner;
- Koreans are reluctant to provide innovations or put innovations to use. However, Slovenians are much more open to using innovations in practice, yet less so in providing them.

Merging these cultural characteristics could, with the right approach, lead to a very successful business model. In particular, such potential can be seen in the following scenarios:

- mother companies from one culture trusting important and time-sensitive projects to their Korean colleagues, since Koreans are more likely to commit to work even during their free time;
- one culture (Slovenia) being more positive towards implementing new ideas, the other (South Korea) could complement it by being forced to study it and run it to perfection. This is supported also by Hofstede, Hofstede and Minkov (2010), who say that countries from both ends of the uncertainty avoidance index scale could supplement each other perfectly – one providing ideas, the other implementing it.

The above conclusions are supported by our personal observations when working at Kolektor Sinyung where we noticed identical behaviour as described in the findings of The Hofstede Centre (2014). The working time alone is already a factor, as in Korea, one work shift normally lasts 12 hours (the legal maximum work week is 68 hours). In Slovenia the legal maximum is 48 hours. While the Korean government has been trying to reduce the maximum work week, the labour unions were strongly against it, which is opposite to the trend in Slovenia. The same goes for the upper age limit for working, which Koreans are continuously fighting to increase, while Slovenians are tyring to decrease.

Supportive of theory and the current results is another situation example which we personally observed. It happened at the beginning of 2011, soon after arriving in Korea. We entered the garage of our apartment block at around 18.30h and saw a car with engine still runnin and a man sleeping inside. From the reports of other people, this was not a case of drunkenness, but rather connected to the example mentioned by Coyner and Jang earlier in our article.

As a final thought, let's see how Hofstede (2001) commented on a popular business slogan »Think globally, act locally.« According to Hofstede, this phrase is naiive and arrogant – no one can actually think globally, but we all think according to our local software. He continues that intercultural encounters are about recognizing that we think differently but are resolving our common problems anyway. His conclusion is a proposed slogan »Think locally, act globally«.

Potential limitations within this research: (i) unusually high number of university graduates among Korean participants, especially given the fact that most are working in production where we would normally expect workers with a lower grade of education. It could be argued it has to do with either a misunderstanding of the intended education level due to different school systems between the countries or the participants – despite the research being anonymous – feeling undervalued if they answered truthfully. (ii) The researched working environment has already existed many years, and was a mixture of Slovenian and Korean culture from the very beginning. This could mean that the workers in this environment have already adapted to some extent to each other over the years. Therefore, more significant differences would be evident if a new working environment were created (with totally new employees).

For potential future replications, a mixed cultural environment with no previous experience of the other cultures would be recommended.

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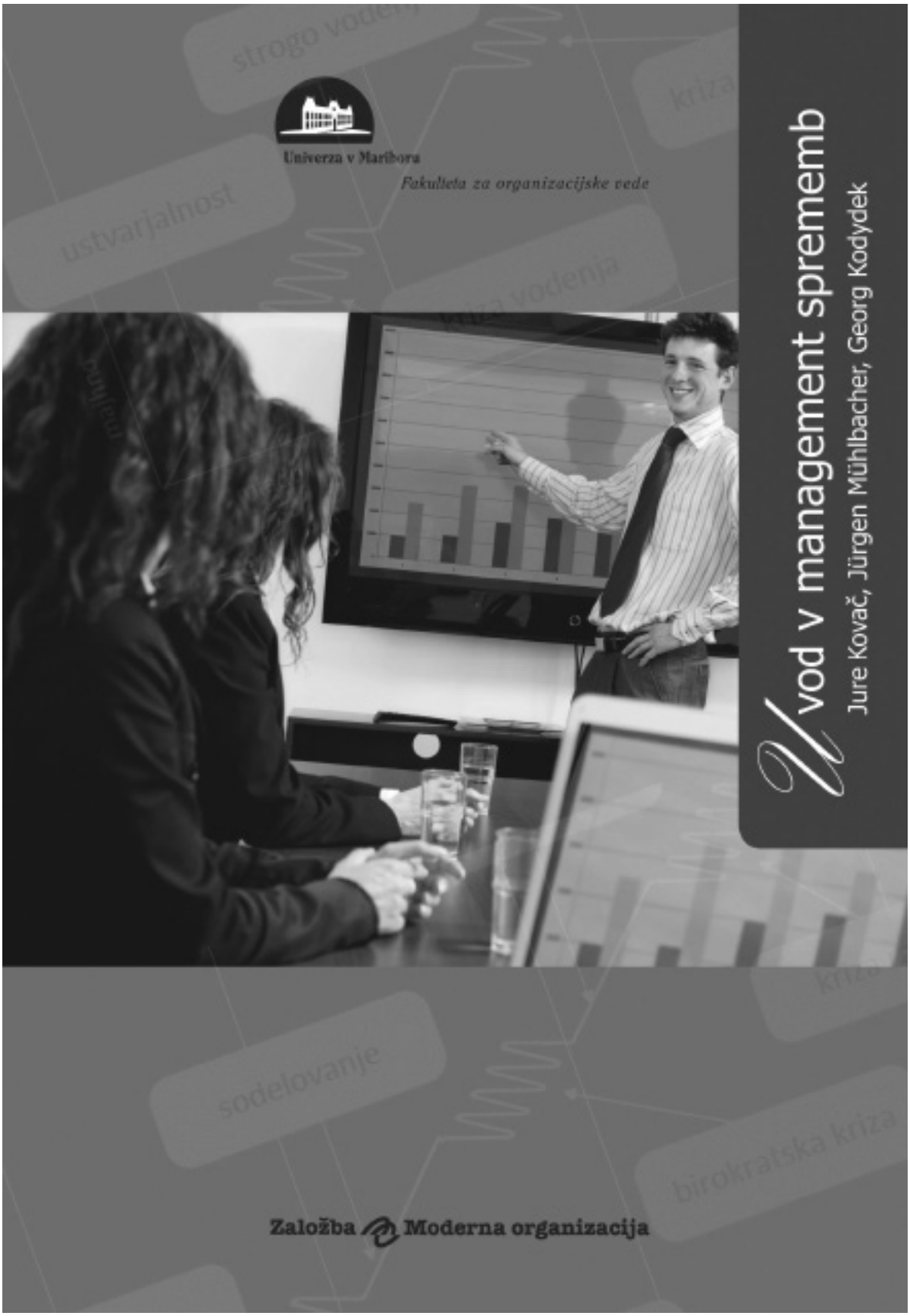
Razlike med narodnimi kulturami so pomembne – primer slovensko-korejskega delovnega okolja

Cilji: Globalni posel danes po navadi od organizacij terja, da so prisotne lokalno v državah, kjer so njihovi kupci. Za uspeh tega je potrebno dobro sodelovanje z domačini, zato se ta članek osredotoča na integracijo različnih narodnih kultur v poslovnem svetu. Doprinos članka je pričakovan za slovenske delavce v tujih podjetjih v Južni Koreji, kot tudi za ostale raziskovalce narodnih kultur. Glavni cilji te raziskave vključujejo primerjavo rezultatov Hofstedejeve IBM raziskave z raziskovanim delovnim okoljem, kot tudi ugotavljanje prednosti za delovno okolje pri združitvah dveh narodnih kultur.
Metode: Ciljnim skupinam znotraj raziskovanega delovnega okolja je bil razdeljen vprašalnik, zbrani podatki pa analizirani s pomočjo SPSS, pri čemer so bile hipoteze testirane s hi-kvadrat testi in t-testi za neodvisne vzorce.
Rezultati: Rezultati so pokazali značilne razlike med dvema narodnima kulturama znotraj delovnega okolja. Razlike glede na narodnost so tako pristone npr. pri strahu ped izražanjem nestrinjanja z nadrejenim, predanosti delu, obravnavanju izzivov, nagnjenosti k izogibanju konfliktom in inovacijam.
Zaključek: Delo z ljudmi iz drugih narodnih kultur zahteva določeno mero prilagodljivosti (učenje o drugi kulturi, pričakovanje neobičajnih situacij). Če je ta prilagoditev uspešna, potem je lahko upsešno tudi sodelovanje med različnimi kulturami, kar lahko pripelje do rezultatov, ki so lahko še boljši kot rezultati kadar delajo skupaj ljudje iz iste narodne kulture.

Ključne besede: *organizacijsko vedenje, narodna kultura, organizacijska kultura, delovno okolje, Južna Koreja, Slovenija*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