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# NETWORK MINING FOR MARKETING INNOVATION: EVIDENCE FROM TOURISM COMMUNITY ENTERPRISES

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**Abstract**: This paper contributes to innovation management and tourism literature by explicating the drawing out of marketing innovation from networks embedding tourism microenterprises. The innovation is vital for commercialising products new to the enterprises, which network into community enterprises for leveraging network sources of innovation. Findings from quantitative analyses of data of Thai tourism community enterprises point to significant positive effects of networks on the innovation. Their impacts, notably those of national-level social networks, are proved stronger than those of conventional knowledge components such as R&D. For managerial implication, the expansion of enterprises' arrays of social networks increases chances for taking out the embedded innovation opportunities.

**Key words:** community enterprise, knowledge network, marketing innovation, microenterprise, social network, Thailand, tourism.

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## Introduction

The importance of marketing innovation has been increasingly recognised though studies about its sources and impacts remain scanty. Since 2003 some EU and OECD countries have monitored it as a policy target. OECD/Eurostat (2005) then defined the marketing innovation as 'the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing' and indicated that it played a key role in product and process development through demand-led innovation and thus firms' performance. Later, governments in developing countries have monitored it within their policy initiatives to support enterprises' innovation. For its sources, however, the innovation may rely less on science and technology (S&T) bases, such as R&D and S&T human resources and expenses, but more on interactions with firms and public institutions or organisational changes (OECD/Eurostat, 2005; NESTA, 2007). The S&T bases may then not be appropriate targets for bringing about the marketing innovation.

Accordingly, this study is to add to the literature by giving evidence that social networks, besides conventional knowledge networks and knowledge components, are one of core providers of the marketing innovation. The network concept in the innovation literature is not new, but mainly focuses on S&T, R&D and formal

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knowledge-transfer networks (OECD, 1992; 1997). The applications of the notion have focused on impacts of networks on patents and product and process innovations (Powell and Grodal, 2005). Along these lines, networks lead to knowledge flows and interactions that are conducive to learning and exploiting knowledge for innovation (Lundvall, 1992; OECD, 1992; 1997). The paper will extend the literature by verifying that social networks directly cause marketing innovation and testing if the added social networks and other knowledge components are compliments interacting to generate the innovation. This follows some studies pointing to innovation impacts of the interactions between innovation sources (Rost, 2011). Overall, the paper attests whether 'network mining', the expanding and leveraging of networks--analogous to data mining—help to extract marketing innovation from embedding networks.

In Section 2, we review the literature on innovation effects of basic and network-related knowledge components, innovation and social networks, and their interactions. In Section 3, the case of Thai tourism community enterprises is selected for study with several useful reasons. First, Thai community enterprises are usually made of microenterprises networking together and widely linking and interacting with external partners for exchanges (and potentially innovation development). Second, they represent the enterprises in tourism and service sectors usually not the support targets of S&T-based innovation programmes (Gallouj, 2000; Miles, 2005). They are anticipated to choose their own alternative--either S&T or non-S&T-sources of innovation. Also, they are mostly rural enterprises; their innovation choices are good learning grounds for other rural, land-based and traditional enterprises with other networking forms. The results of the study are expected applicable to kinds of enterprise in any sectors attempting to expand formal and informal networks. Section 3 details data collection of the representative case and measures and methodology used. Section 4 presents results discussion based on factor and regression analyses. Finally, Section 5 provides managerial implication and conclusion.

## Literature Review

Knowledge components and their positive contributions to innovation

*R&D activities* have been established as central knowledge bases for innovation (OECD, 1992; 1996b), given that the 'R' is tied to S&T frontier or new technologies. In practices, innovation surveys in most countries have measured and treated them as core innovation sources (OECD, 1996b; OECD/Eurostat, 2005). For enterprises behind the S&T frontier, the 'D' may be more important. Cohen and Levinthal (1989) and following studies expand the functions of R&D to include the absorption, assimilation, and exploitation of new and old external knowledge for both innovation creation and imitation of new products and processes. These functions are parts of 'absorptive capacities' or broader 'technological capabilities' (Lall, 1992; Hobday, 1995). So, enterprises in any sectors including tourism and service sectors may utilise R&D as an input for

innovation as an output. Related to R&D is the knowledge embodied in equipment. This knowledge, measured in terms of *investments in equipment*, is assumed a result of R&D and embodied in each new vintage of capital goods invented on the basis of the new knowledge discovered (Romer, 1990). The new vintage of machinery may lead to technical change (Verspagen, 2005), new production processes, new products, and new organisational forms (OECD, 1992). This knowledge is available for enterprises behind the technological frontier when the capital goods diffuse (Lall, 1992). Overlapping with above are knowledge transfers between parties. Collaborate R&D and investments in equipment both involve *formal knowledge transfers.* The former may involve various directions and levels of interactions for knowledge transfers (Powell and Grodal, 2005) while the later may concern only embodied knowledge transfers. Added sources of formal knowledge transfers are disembodied, codified knowledge in technology licenses and patents (UNCTAD, 2014). However, studies have found that in innovation-generating process they need parting with tacit, *informal knowledge transfers* through interactive on-the-job training and learning (Lall, 1992; Hobday, 1995) or knowledge spillovers within and between enterprises through regular operations, value chains and other forms of business interactions and clusters (Porter, 1990; Lundvall, 1992; OECD, 1999). Additionally, for tourism and service sectors *training* has been stressed a rudimentary innovation contributor. There exists a requirement of higher skills to combine tacitly with other forms of technology, to engender service innovation (Gallouj, 2000; Miles, 2005). Finally, service and manufacturing sectors receive innovation contributions from *investments in information and communication technology (ICT)* (Mouri and Ali Arshad, 2016). Their contributions come not only from embodied equipment but more from flows of knowledge they transmit given their networking features. Through value chains and networks that ICT equipment connects to, flows and uses of knowledge are enriched, resulting in innovation (Porter, 1985). In service sectors, ICT uses may make new trajectories of service innovation (Miles, 2005).

Networks, network-knowledge interactions and positive effects on innovation

The innovation network literature illuminates broader angles of networks in driving innovation than those related to above ICT and knowledge transfers. Most important is relating networks' enabling qualities for searching for, storing and diffusing new knowledge and technologies for innovation development under national, regional and local systems of innovations (Lundvall, 1992; OECD, 1996a; 1997) and interacting with users (Lundvall, 1992), customers (Thomke and von Hipple, 2002) in commercialising and/or overall processes of innovation. In the cluster literature, informal networks which locate tacit knowledge for innovation are underlined, notably those farther from research-based components and closer to spillovers from business alliances and competitors, and interactions with consumers (Porter, 1990; OECD, 1999). Besides, the social network literature provides grounds for studying such tacit, informal sources of innovation. Actually, all interactive-based innovation concepts imply informal social networks

embedding around enterprises (Perez-Luno et al., 2011). Along these lines, a debate has pursued whether 'weak ties', typical external, structural networks, or 'strong ties', typical internal, relational networks, contribute more to innovation, given chances of substitutes between them (Cuevas-Rodriguez et al., 2013). The former ties encompass sparse, bridging networks expanding to cover diverse parties, bringing in varieties of information and knowledge flows and resource exchanges and combinations for innovation development (e.g. Granovetter, 1973; Burt, 1992). The latter ties embrace solid, bonding networks, strengthening trust and beneficial qualities of relation positive for knowledge sharing and resource exchanges and combinations (e.g. Coleman, 1990; Perez-Luno et al., 2011; Cuevas-Rodriguez et al., 2013). However, studies reveal that both kinds of network can be used together and are compliments rather than substitutes (Rost, 2011). Perez-Luno et al. (2011) finds a significant positive effect on innovation from the network-knowledge tacitness interaction but no significant impact from network-knowledge complexity interaction. Hence, it is of advantage if we here initially assume hypothetical positive effects on marketing innovation of the interactions between above knowledge components and informal social networks, and next verify them with apposite data. Apart from direct effects from each source, the positive indirect interaction effects--which probably better for the case of marketing innovation and of a service sector like tourism--will further endorse the concept of social network mining for innovation.

## Research Methodology

Data and measures

As mentioned, this study relies on data of rural, Thai tourism community enterprises. They are four-yearly undated data of original research project supported by Thailand's National Research Council Fund in 2012. In that year, a random across-country sample of 178 of the total of 345 officially registered tourism community enterprises responded to questionnaires exploring levels of their innovations, knowledge bases and social networks, marking the margin of error about 5.2% gauged by Yamane's formula for determining sample size. This time the data were updated during November 2016 and February 2017 from only accessible 134 of the 178 enterprises, to prepare a comparison report. The margin of error then increases to about 6.8% by the same formula. The data include what has happened within four years. Measures include: *Marketing innovation variables* comprising the numbers of new product characteristics and packaging, of new distribution techniques and channels, of new promotion and advertising techniques, of new price techniques, and of marketing research*; knowledge component variables* embracing R&D activity, investment in equipment, investment in ICT and training—for which a dichotomous scale, either 1 (have) or 0 (have not) is used, and the levels of informal knowledge transfer, of systematic knowledge transfer, of through-training knowledge transfer--for which a Likert scale of between 1 (low) and 4 (highest) is used; and *social network variables* including

informal social network types. That is, the level of business network utilisation, the degrees of collaboration within the community enterprise, of acquaintance with representatives of national agencies, of participation in networks and associations at the national level, of acquaintance with representatives of local agencies, and of participation in networks and associations at the local level-for which a Likert scale of between 1 (low) and 4 (highest) is used. Following previous studies which include age and size of enterprises as control variables (Perez-Luno et al, 2011; Cuevas-Rodriguez et al, 2013), we use year in operation and the number of members in standardised form to stand for them.

Methods

The study first carries on a measurement analysis by applying a factor analysis to above measures, as to obtain latent variables (factors) which will help to avoid multicollinearlity and attain discriminant and convergent validities (Perez-Luno et al., 2011; Cuevas-Rodriguez et al., 2013). The latent variables (also required to be consistent with above theoretical grounds) will be used in a hierarchical regression analysis, which first find effects on marketing innovation variables of groups of control and knowledge component variables, then those of groups of social network variables over the former groups, and lastly those of groups of the interaction variables--the multiples of each knowledge component variable and each social network variable--over those of groups of social network variables. Also, each regression coefficient of each variable is interpreted for its innovation contribution.

## Results Discussion

Measurement analysis

Initially, we test for sampling adequacy of all the variables. The Bartlett's test of sphericity for the variables is significant at the 0.01 level; the Kaiser-Meyer-Olkin (KMO) value is 0.735, which is higher than 7.0, a minimal KMO value guaranteeing sampling adequacy (Palmberg, 2004). The Cronbach's alpha values for groups of marketing innovation, knowledge component and social network variables are 0.707, 0.671 and 0.715, respectively. They all are higher than the 0.6 minimum value for guaranteeing the validity of aggregation (Malhotra, 1997). Table 1 below discloses all the factor loadings, which are the result of an exploratory factor analysis. Each variable along the row with the **bolded** factor loading in a crossing column institutes a component of that factor along the column, given that its factor loadings in other columns (with other factors) are smaller. Hence, we have two innovation factors: *'Core marketing innovation'* comprising the numbers of new product characteristics and packaging, of new distribution techniques and channels, of new promotion and advertising techniques and of new price techniques; and *'marketing research'* including only the number of marketing research.

**Table 1**. **Factor Analysis for Latent Variables**.

| **Marketing innovation factors**: (**factor loading in bold; cumulative variance explained** = 66.807%) | **Core marketing innovation** | **Marketing research** |
|---|---|---|
| The number of new product characteristics and packaging | ***.751*** | .077 |
| The number of new distribution techniques and channels | ***.784*** | -.156 |
| The number of new promotion and advertising techniques | ***.714*** | -.074 |
| The number of new price techniques | ***.761*** | .320 |
| The number of marketing research | -.008 | ***.966*** |

| **Social network factors**: (**factor loading in bold; cumulative variance explained** = 76.299 %) | **Innate network** | **National social network** | **Local social network** |
|---|---|---|---|
| Level of business network utilisation | ***.783*** | .114 | .048 |
| Degree of collaboration within the community enterprise | ***.824*** | .047 | .046 |
| Degree of acquaintance with representatives of national agencies | .087 | ***.892*** | .012 |
| Degree of participation in networks/associations at the national level | .094 | ***.890*** | .134 |
| Degree of acquaintance with representatives of local agencies | -.041 | -.046 | ***.910*** |
| Degree of participation in networks/associations at the national level | .165 | .215 | ***.859*** |

| **Knowledge component factors**:(**factor loading in bold; cumulative variance explained** = 66.075%) | **Basic knowledge factor** | **Knowledge transfer factor** | **Training factor** |
|---|---|---|---|
| R&D activity | ***.762*** | -.121 | .279 |
| Investment in equipment | ***.837*** | .099 | -.151 |
| Investment in ICT | -.136 | ***.611*** | .041 |
| Level of systematic knowledge transfer | .162 | ***.690*** | .248 |
| Level of informal knowledge transfer | .012 | ***.767*** | .056 |
| Level of through-training knowledge transfer | .115 | .454 | ***.766*** |
| Training activity | -.003 | .026 | ***.929*** |

Also, we have three social network factors: *'Innate network'* containing the level of business network utilisation and the degree of collaboration within the community enterprise; *'national social network'* embracing the degrees of acquaintance with representatives of national agencies and of participation in networks and associations at the national level; and *'local social network'* containing the degrees of acquaintance with representatives of local agencies and of participation in networks and associations at the local level. Finally, we have three knowledge component factors: *'Basic knowledge factor'* embracing R&D activity and

investment in equipment; *'knowledge transfer factor'* containing investment in ICT and the levels of informal and systematic knowledge transfer; and *'training factor'* including the level of through-training knowledge transfer and training. All the statistically derived factors are consistent with theoretical grounds, except that knowledge transfer and training factors need further examination. Both contain more or less network-related knowledge components. Investment in ICT may increase networks and knowledge transfers through networks. Some of the knowledge obtained from training is transferred through networks and others from in-house. Next to social networks, the two factors are somewhat influenced by and responsive to network mining.

Hierarchical regression analysis

In Table 2 below, the hierarchical regression of *core marketing innovation* in the first step on control variables and knowledge component factors, in the second step also on social network factors, and in the third step also on the interaction terms results in the Knowledge Model, Network Model, and Interaction Model, respectively. The F-statistic values for all the models are significant at the 0.01 level, indicating a high level of goodness of fit for all. Essentially, the change in multiple-squared correlation coefficient ($R^2$) for the Network Model from that for the Knowledge Model (resulting from including in the group of social network variables) is proved by F for Chang in $R^2$ significant at the 0.01 level. This validates significant effects of the group of social networks on the marketing innovation. However, the change in multiple-squared correlation coefficient ($R^2$) for the Interaction Model from that for the Network Model (resulting from including in the group of interaction variables) is proved by F for Chang in $R^2$ not significant, not supporting the effects of the overall group of interaction terms on marketing innovation. Note that the hierarchical regression of *marketing research* on all groups of the latent variables is proved not significant in all regression steps; therefore, we skip reporting its outcomes. Based on standardised coefficients in Network and Interaction Models, the variables having significant positive effects on core marketing innovation at least at the 0.05 level of significance include national social network, innate network, training, and knowledge transfer factors. Basic knowledge factor has a significant positive effect on the innovation at the 0.10 level. Note that local social network has no significant effect on marketing innovation. National social network and innate network averagely pair with training factor but stronger than knowledge transfer and basic knowledge factors in causing the innovation. In the Interaction Model, only the multiple of national social network and training factor yields a significant (at the 0.10 level) positive effect.

**Table 2. Hierarchical Regression of Marketing Innovation on Latent Variables**

| | **Dependent variable**: **Core marketing innovation** | | |
|---|---|---|---|
| | **Knowledge Model** | **Network Model** | **Interaction Model** |
| The number of members | -.119 | -.125* | -.122* |
| Year in operation | -.165** | -.143** | -1.54** |
| Basic knowledge factor (BKF) | .228*** | .130* | .166* |
| Knowledge transfer factor (KTF) | .359*** | .176** | .184** |
| Training factor (TF) | .366*** | .234*** | .284*** |
| Innate network (IN) | | .275*** | .244*** |
| National social network (NDN) | | .260*** | .258*** |
| Local social network (LDN) | | .007 | .028 |
| IN*BKF | | | -.001 |
| IN*KTF | | | -.016 |
| IN*TF | | | -.078 |
| NDN*BKF | | | -.106 |
| NDN*KTF | | | -.007 |
| NDN*TF | | | .148* |
| LDN*BKF | | | 0.780 |
| LDN*KTF | | | -0.770 |
| LDN*TF | | | -0.870 |
| $R^2$ | .321 | .405 | .450 |
| Adjusted $R^2$ | .294 | .366 | .369 |
| Change in $R^2$ | .321 | .084 | .045 |
| F | 12.087*** | 10.614*** | 5.572*** |
| F for Chang in $R^2$ | 12.087*** | 5.862*** | 1.054 |
| * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ | | | |

## Managerial Implication and Conclusion

The above findings support this paper's endeavour to publish the importance of network mining--the upholding and leveraging of networks--for drawing out of marketing innovation from networks and network-related components. The informal, innate and national social networks are verified as central contributors to the innovation. These innovation generators embrace the business network utilisation, the collaboration within community enterprise, the acquaintance with representatives of national development agencies, and the participation in networks and associations at the national level. For managerial implication, an enterprise's attempt to uplift marketing innovation by amplifying these networks promises stronger innovation effects than those of network-related knowledge components, such as ICT investment and informal and systematic knowledge transfers, and then those of basic S&T elements, respectively. Their effects tie with those of training. Yet, local-level social networks provide non-significant impact. In the context of the literature in Section 2, the above social networks may provide knowledge flows

and interactions that are conducive to learning and exploiting knowledge and resource exchanges and combinations (Granovetter, 1973; Coleman, 1990; Burt, 1992; Perez-Luno et al., 2011; Rost, 2011) suitable for marketing innovation development in the tourism segment. In a previous qualitative analysis on Thai tourism community enterprises (Patluang, 2012), the informal social networks may lead to innovation by means of advices on, connections to and/or supports of information, knowledge bases, and/or actual innovation development from ranges of organisations and their agents within the networks. Specifically, in the present quantitative analysis, the innate and national-level social networks can perform such function better than local-level social networks. The results also attest that there is overall no significant (positive or negative) interaction effect on the innovation from the interactions between social networks and knowledge components. Attempting to raise the marketing innovation, we can thus augment both innovation sources together without trading-off effects.

Managerially, for rural tourism microenterprises, searching for and leveraging new networks, ranging from the establishment of community and other network forms of enterprises to the uplifting of business network utilisation, of acquaintance with representatives of national development agencies, and of participation in networks and associations at the national level, are essential for competing by marketing innovation. Expectantly, the above management strategies can be generalised for enterprises in land-based, traditional and other rural sectors as well as for different network forms of enterprise in the tourism sector. A dynamic policy implication is that government and public agencies may extend the innovation by provisions and incentives that are supportive to the extensions of all the above vital networks.

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## EKSPLORACJA SIECIOWA DLA INNOWACJI MARKETINGOWYCH: DANE Z PRZEDSIĘBIORSTW BRANŻY TURYSTYCZNEJ

**Streszczenie:** Niniejszy artykuł traktuje o zarządzaniu innowacjami w oparciu o literaturę branży turystycznej poprzez wyjaśnienie wykorzystania innowacji marketingowych w sieci obejmujących mikroprzedsiębiorstwa turystyczne. Innowacje mają zasadnicze znaczenie

dla przedsiębiorstw dla komercjalizacji nowych produktów, które łączą się w przedsiębiorstwa współpracujące w celu wykorzystania sieciowych źródeł innowacji. Wyniki analizy ilościowej danych tajlandzkich przedsiębiorstw turystycznych wskazują na znaczące pozytywne skutki sieci dla innowacji. Ich wpływ, w szczególności na sieci społecznościowe na poziomie krajowym, okazuje się silniejszy niż w przypadku tradycyjnych komponentów wiedzy, takich jak badania i rozwój. W przypadku implikacji menedżerskich ekspansja przedsiębiorstw w sieciach społecznościowych zwiększa szanse na wykorzystanie szans związanych z innowacjami.
**Słowa kluczowe:** przedsiębiorstwo społeczne, sieć wiedzy, innowacje marketingowe, mikroprzedsiębiorstwo, sieć społecznościowa, Tajlandia, turystyka.

## 营销创新网络挖掘:旅游社区企业的证据

**摘要:**通过对旅游微型企业网络营销创新的阐述，对创新管理和旅游文献作出贡献。创新对于将企业新产品商品化至关重要，这些产品通过网络向社区企业网络化，以利用网络创新来源。泰国旅游社区企业数据量化分析的结果显示，网络对创新具有显着的积极作用。它们的影响，特别是国家级社交网络的影响，被证明比传统知识组件如研发的影响更强。对于管理层而言，企业社交网络阵列的扩张增加了挖掘嵌入式创新机会的机会。
**关键词:**社区企业，知识网络，营销创新，微型企业，社交网络，泰国，旅游。