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TRANSFORMING IMPLEMENTATION OF ENTREPRENEURSHIP EDUCATION PROGRAMME IN TECHNICAL TRAINING INSTITUTIONS IN KENYA

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ABSTRACT: Effectiveness of implementation of entrepreneurship education programme in technical training institutions in Kenya is in question. Teaching and assessment methods used by teachers are insensitive to entrepreneurship learning, and the training resources provided by the institutions are insufficient. The study examined factors influencing implementation of the programme as conducted in tertiary technical institutions in Kenya. It investigated the influence of teaching and assessment methods, teachers' network with entrepreneurship practitioners, and availability of training resources. A census survey of entrepreneurship education teachers in technical training institutions in Nairobi County was conducted, using a structured self-administered questionnaire. Data were analyzed using SPSS. The findings show that teachers routinely use traditional teaching and assessment methods, and institution administrations do not provide sufficient training resources or support teachers to develop networks with entrepreneurship practitioners. Recommendations include sensitizing teachers to use pedagogies that maximize entrepreneurial learning, and administrators to provide sufficient resources; also establishing a national policy framework to enforce effective programme implementation.

KEYWORDS: Entrepreneurship Education, Teaching Methods, Assessment Methods, Teacher's Network, Training Resources

INTRODUCTION

Entrepreneurship education is an inevitable strategy for inculcating an entrepreneurial culture and orientation in a nation, creating employment, raising individual incomes, transforming communities and enhancing national economic development. Nations that have embraced entrepreneurship have made good progress in addressing the problem of unemployment, and achieved impressive results (Alakbarov, 2010). Entrepreneurship education is ubiquitous because it lends itself to application in all career fields, permeating the whole socio-economic fabric, enhancing profitable tapping into human potential, and exploiting available natural resources (ROK, 2005;Maina, 2006). Sustained entrepreneurship education breeds sustained entrepreneurship, which in turn multiplies entrepreneurial activity, creates employment, alleviates poverty, enhances living standards, initiates the process of industrialization (ROK,

2005; Alakbarov, 2010; Smith & Paton, 2011) and positions a developing nation on the launching pad for industrial take-off.

Many youth in Kenya encounter entrepreneurship education for the first time in technical training institutions (TTIs). It is argued that the impact of entrepreneurship education on their post-training career choice and practice is influenced by the teaching and assessment methodologies used in delivering entrepreneurship education lessons, teachers' personal interaction with entrepreneurship practitioners, and the availability of training resources (Maina, 2006; Pihie & Bagheri, 2011). This study assessed the influence of these factors on implementation of the entrepreneurship education programme, with a view to transforming it to orientate learners towards career entrepreneurship, and ultimately developing a pervasive entrepreneurship culture in the Kenyan society.

LITERATURE REVIEW

Teachers use teaching methods to convey entrepreneurship knowledge, skills and attitudes to learners. Research has established that entrepreneurs learn differently from others (Fredrick, 2007; Gatchalian, 2010). They "require active and concrete pedagogical interventions ... through deepening learning in theory, process and practice of entrepreneurship" (Fredrick, 2007:1). Empirical studies have recommended a vast array of pedagogies for delivering entrepreneurship education. They include lectures, team teaching, group assignments, field tours/visits, internet search, telemedia, print media, business plan, case study, problem-based learning, student presentations, use of role models/success stories, seminars/workshops, decision-making exercises, attachment, internship, consulting assignments, actual running of a small business, research project on an existing business, etc. (Jones & English, 2004; Fredrick, 2007; Sherman et al, 2008; Gatchalian, 2010; Mansor & Othman, 2011). Despite the plethora of alternatives, the entrepreneurial mindset orientation in TTI graduates still seems to be elusive (Maina, 2006; Pihie & Bagheri, 2011).

Empirical evidence shows that using traditional methods, such as the lecture and its variant "chalk and talk" to teach entrepreneurship education, merely results in a knowledgeable person (Smith & Paton, 2011), as these methods lack initiative for application. While studies vindicate their effectiveness in maximizing the efficiency of teacher-learner knowledge transfer on one hand (Sherman *et al*, 2008), on the other they demonstrate them to be static, and fail to respond to the naturally dynamic business environment (Sherman *et al*, 2008; Smith & Paton, 2011). Their utility remains in creating entrepreneurial awareness.

Mere entrepreneurial awareness cannot develop entrepreneurial practice. To develop entrepreneurial practice requires methods capable of instilling transversal entrepreneurial skills. In tandem with Kolb's experiential learning model (Kolb, 1984), different learning opportunities for optimum development of the various students' entrepreneurial capabilities have to be designed into curriculum delivery. Gatchalian (2010) found that both teachers and students strongly supported experiential methods. Basing his findings on the grounded theory approach, Fredrick (2007) concluded that entrepreneurs require experiential pedagogical interventions. Experiential methods transport learners to the defining experience of deciding whether or not to

choose entrepreneurship as a career option after training (Sherman *et al*, 2008). This is the object and philosophy of entrepreneurship education.

Assessment of entrepreneurial learning outcomes is integral to educational practice, as it measures the extent of achievement of the objectives of an educational activity (Pittaway et al, 2009). Assessment outcomes justify expenditure of resources on entrepreneurship educational efforts. The Typology of Entrepreneurship Education and Assessment Practice (Pittaway & Edwards, 2012) is important in discussing assessment of entrepreneurial learning outcomes. The typology shows that assessment should demonstrate not only the knowledge, but also the skills, attitudes and the transversal entrepreneurial competencies that operationalise entrepreneurship in the economy. Empirical studies show that assessment predicts the methodologies selected to deliver entrepreneurship content (Tranchet & Rienstra, 2009; Pittawayet al, 2009). At the same time, other empirical studies show that assessing entrepreneurship learning outcomes is a big challenge (Pittawayet al, 2009; Tranchet & Rienstra, 2009; Pittaway & Edwards, 2012). There are critical concerns about the use of conventional methods, such as written tests and examinations, to measure practical entrepreneurial skills and attitudes, because they do not bring out the results that educators expect (Sherman et al, 2008; Pittaway et al, 2009). Regrettably, there is a paucity of research on entrepreneurship education assessment (Pittaway & Edwards, 2012).

The framework of entrepreneurial learning outcomes presented by Pittaway *et al* (2009) highlights eight areas which reflect changes in behaviours, empathy, values, motivations, awareness, competencies, venture creation knowledge, and ability to manage relationships. The framework informs key considerations of an effective assessment practice. Pittaway and Edwards (2012) identified nine entrepreneurship assessment methods which focus on entrepreneurial learning outcomes. When they applied them to sampled entrepreneurship education courses in different UK and US institutions, they found that assessment practice in more than half of them focussed on knolwledge acquisition rather than entrepreneurial skills development. Bilen *et al* (2005) concluded that in an entrepreneurship education programme, formative assessment should start as soon as students begin the programme, but advised that the effects can only be evaluated after students enter the job market. This challenges eductors to critically consider entrepreneurship education assessment, in the light of its role to appraise the process and product of entrepreneurship education.

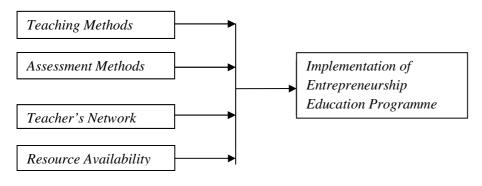
Entrepreneurship educators' networks with entrepreneurship practitioners and stakeholders play an important role in delivering entrepreneurship education to students (Gatchalian, 2010). Through networks educators accumulate tacit knowledge, which enhances their teaching competence. Networks also facilitate a coordinated approach for teaching entrepreneurship education. The manifold benefits of networks to students include accessing attachment opportunities in real enterprise environments; contributing to the development of human resource management skills (Thompson *et al*, 2009); enhancing the relevance of entrepreneurship education (Mansor & Othman, 2011); activating social links and interactions (Pittaway*et al*, 2004); and facilitating opportunity recognition, entrepreneurial orientation, the vocational decision to become an entrepreneur, and entrepreneurial intention. Network resources include foundations, private companies, entrepreneurs, government agencies, science parks/incubators,

business development service (BDS) providers, and other bodies specialized in entrepreneurship training (Klyver *et al*, 2007).

Implementing an entrepreneurship education programme implies resource imperatives. The programme requires to be institutionalized by creating and staffing an autonomous entrepreneurship education department, to be a repository for learners, staff and the surrounding community to access educational programmes, networking opportunities, equipment and resources to develop entrepreneurship both within the institution and in the local community (Nelson & Johnson, 1997; Mansor & Othman, 2011). Jones and English (2004) emphasized the importance of resources for developing a teaching strategy modelled on the entrepreneurial process itself. In Kenya, when entrepreneurship education was introduced in TTIs, a critical recommendation for each institution was to establish a small business centre (SBC). An SBC is a central location that provides access to resources that facilitate the development of small enterprises (Nelson & Johnson, 1997). SBCs are able to create an in-house link between theory and practice, thereby linking entrepreneurship education with entrepreneurship practice (Tranchet & Rienstra, 2009).

The local business community is an important educational resource base of role models to motivate students for career entrepreneurship. Engagement of the business community involves a cost element, but entrepreneurship education is fraught with challenges of capitalization (Tranchet & Rienstra, 2009; Industry Canada, 2010). Since a sustained provision of financial resources is an imperative for an entrepreneurship education programme (GOK, 2000; Bilen *et al*, 2005), institutions should devise strategies for financial resource mobilization to supplement government allocation. Inadequate resources translate into ineffective teaching, which fails to boost graduates' self-efficacy.

The conceptualised relationship between the independent and dependent variables is shown in Figure 1.



Independent Variables

Dependent Variable

Fig. 1 Conceptual Framework

METHODOLOGY

The study used a survey research design. The sampling frame was the list of accredited TTIs in Nairobi County, compiled by The Ministry of Higher Education, Science and Technology (GOK, 2013). Institutions included in the study were those that offer the technical education curriculum examined by Kenya National Examination Council (KNEC), as this is the body authorized to examine the technical education curriculum in TTIs in the country. The study utilized a self-administered structured questionnaire, which was refined after a pilot study. A content validity index of 0.78 was obtained; this was judged to be acceptable, as it is more than the 0.70 value recommended minimum (Wynd *et al*, 2003). The Cronbach's alpha reliability index was 0.73, also deemed acceptable in comparison with the 0.70 recommended minimum (Santos, 1999).

A census of all teachers of entrepreneurship education in the 17 TTIs in Nairobi County was conducted. This yielded a population of 58 teachers. The study used descriptive statistics, factor analysis and simple linear multiple regression to show the relationship between the dependent and the independent variables.

RESULTS

54 of the 58 questionnaires distributed were filled and returned, constituting a response rate of 93.1%. The findings indicate that majority (85.5%) of respondents agreed that teaching methods influence implementation of entrepreneurship education programme. This was further evidenced by a high mean of 4.29 (measured on a scale of 1.00 to 5.00), with a standard deviation of .961. Similarly, majority (72.1%) agreed that assessment methods have an influence on implementation of entrepreneurship education programme, with a mean of 3.99 and a standard deviation of .807. Likewise, majority (91.5%) agreed that teacher's network influences implementation of the programme; its corresponding mean was 4.44 and standard deviation .708. With respect to training resources, majority (89.7%) agreed that their availability has an influence on implementation of the programme; the mean was 4.40 and standard deviation .801. The direction of influence of each of the independent variables on the dependent variable was positive.

When respondents rated fourteen different teaching methods according to their effectiveness in teaching entrepreneurship education, they placed the lecture at position 12, meaning that they perceive it to be relatively ineffective. However, when they rated the same methods according to their frequency of use, they elevated it to position 1, meaning that they use it more frequently than any other method to teach entrepreneurship education. They also rated eight different assessment methods according to their effectiveness in assessing entrepreneurship education learning outcomes. They ranked the traditional written tests and exams at position 4. However, according to frequency of use, they elevated it to position 1 out of 8, indicating that they use it more frequently than any other method. These results show that teachers routinely use the relatively ineffective traditional teaching and assessment methods to deliver entrepreneurship education, knowingly avoiding the more effective ones.

The findings also show that majority (86.2%) of the respondents affirmed the importance of networks in the teaching of entrepreneurship education, with a mean of 4.44, and a standard

deviation of .708. Moreover, a majority (64.2%) of the respondents network with practitioners to enhance the relevance of their teaching, describing the network as a strategic intervention to develop an entrepreneurship culture in learners. With respect to availability of training resources, majority (96.2%) opined that resource availability positively influences programme implementation. They pointed out that entrepreneurship education requires unique training resources.

Concerning implementation of the programme, majority (88.9%) of the respondents opined that the programme has not been fully implemented. The overriding culprit (identified by 71.7% of the respondents) was inadequate training resources. The next significant reason attributed to this verdict was the theoretical, rather than practical, presentation of the subject content (a mere 9.4%). These results show that it is mainly resources that impede programme implementation.

A principal components factor extraction was performed to obtain the most significant components for each of the independent variables. The components extracted were those with an eigen factor loading of more than 1.0, as these are the ones which have more weight in explaining the independent variables. The importance of teaching methods was mostly attributed to two components - their ability to foster a strong entrepreneurial orientation, and their ability to foster a strong entrepreneurial culture. The cumulative variance of these two components was 54.4%. The importance of assessment methods was attributed to three components - their ability to measure achievement of educational objectives, their ability to predict teaching methods to be used, and the challenging nature of assessment in entrepreneurship education. The cumulative variance of these components was 65.8%.

The influence of teacher's network of interaction with entrepreneurship practitioners was mostly explained by three components - its role in providing unique benefits to entrepreneurship education learners, ensuring a coordinated approach in teaching entrepreneurship education, and influencing formation of entrepreneurial orientation and entrepreneurial culture. These components had a cumulative variance of 63.1%. The influence of availability of training resources on implementation of the programme was mostly explained by three components – the requirements of unique human resources, unique non-human resources, and an autonomous department. The cumulative variance of these components was 71.3%.

A regression model was run to show the relationship between the dependent variable and the independent variables.

Y = 1.431 + .601(TM) + .585(AM) + .568(TN) + .676(RA)

Where Y=Implementation of Entrepreneurship Education Programme

TM=Teaching Methods

AM=Assessment Methods

TN=Teacher's network

RA=Resource Availability

The model shows that resource availability had the most influence on programme implementation, followed by teaching methods, assessment methods, and finally teacher's network.

DISCUSSION

The study set out to determine factors influencing implementation of entrepreneurship education programme in TTIs in Kenya. The variables suspected to bear on the implementation were teaching methods, assessment methods, teacher's network, and availability of training resources. A review of related literature and empirical studies informed the formulation of questions used to obtain the research data. The results indicate that there is a strong positive relationship between teaching methods and programme implementation. Furthermore, they indicate that the traditional lecture method is used almost as a standard norm. These findings are in agreement with those by Sherman et al (2008), Luyima (2010), and Pittaway & Edwards (2012), which found that traditional teaching methods are used extensively to deliver entrepreneurship education, although they are not effective in developing an entrepreneurial orientation or inculcating an entrepreneurial culture. Teachers do not give entrepreneurship education the appropriate pedagogical approach that it deserves. The study also found a strong association between assessment methods and programme implementation. Although ineffective in developing an entrepreneurial orientation or inculcating an entrepreneurial culture, traditional assessment methods are routinely used. This also is in agreement with Pittaway et al, (2012), and Luyima (2010), who submitted that traditional methods do not challenge learners to exploit their problem-solving potential or knowledge-constructing mental faculties.

The findings also showed a positive relationship between teacher's network with entrepreneurship practitioners and programme implementation; this is consistent with other empirical studies (Klyver et al, 2007; Pittaway *et al*, 2004; Pittaway *et al*, 2009 Gatchalian 2010), which found that entrepreneurs utilize networks to start, operate and grow their enterprises. The study also found that teachers take initiatives to establish these networks to enhance the relevance of entrepreneurship to their students; however, their TTI administrations do not support them in these network endeavours. The study also established a strong positive relationship between training resources and programme implementation; this corroborated previous studies (Industry Canada, 2010; Luyima, 2010), which belaboured the importance of resources in any meaningful programme implementation. An elaborate programme design serves as a reference checklist for assembling the requisite resources, as an effective entrepreneurship education programme is predicated upon them (Nkirina, 2009). The outcome of an incomprehensive programme is graduates with non-functional entrepreneurship knowledge.

IMPLICATION TO RESEARCH AND PRACTICE

Previous studies in Kenya have focused on the role of entrepreneurship education in job creation, enterprise management and economic development (Simiyu, 2010; Mwangi, 2011; Warren, 2011); hardly any have addressed the process of delivering enterpreneurship education. This research provides new knowledge to guide educational practice, by making an initial foray into the teaching of entrepreneurship education in Kenya. The envisaged entrepreneurially empowered TTI graduate is a product of the training function.

CONCLUSION

The study set out to examine factors which affect implementation of entrepreneurship education programme in TTIs in Kenya. The variables investigated were teaching methods, assessment methods, teacher's network, and availability of training resources. The findings show that teachers do not accord entrepreneurship education the appropriate pedagogical approach that it deserves; they seem resigned to using ineffective traditional pedagogies. Meanwhile, the subject is inadequately resourced by TTI administrations.

The results of this research invite the attention of entrepreneurship educators, practitioners and stakeholders to employ effective strategies for developing entrepreneurial key competencies in TTI trainees. Teachers should abandon their heavy reliance on traditional teaching and assessment methods, and embrace experiential methods. Administrators of TTIs should be sensitized on the importance of providing adequate training resources for entrepreneurship education. A national policy framework is needed to ensure availability of sufficient resources for the programme. This study was conducted in TTIs in Nairobi County. However, the situation obtaining in other TTIs outside the scope of this study is believed to be comparable. Therefore these findings may have application in their contexts.

FUTURE RESEARCH

There is a glaring need to conduct more studies on pedagogical interventions in entrepreneurship education in Kenya and the wider African context. Increasingly, certain critical factors influencing effectiveness of pedagogical interventions require investigation. They include orientation of teachers who teach the subject, the role of institutional SBCs, and a formal entrepreneurship association for entrepreneurship education practitioners and learners. This research should be replicated elsewhere outside Nairobi to establish if these findings hold true in similar institutions.

REFERENCES

- Alakbarov, I. (2010) Azerbaijan's Success Story on Sustainable Entrepreneurship Development Through Adoption of Policies, Financing and Innovative Strategies, In International Conference on Policies to Address Financing and Entrepreneurial Challenges in High-growth Innovative Firms (2-4 June 2010), Helsinki.
- Bilen, S. G., Kisenwether, E. C., Rzasa, S. E., & Wise, J. C. (2005) *Developing and assessing students entrepreneurial skills and mind-set*, Journal of Engineering Education, Vol. 94, Iss. 2, pp. 233-243.
- Frederick, H. H. (2007) Blended Learning in Entrepreneurship Education in the Asia-Pacific: A Grounded Approach to Entrepreneurship Pedagogy, In Small Enterprise Conference, 23-26 Sep 2007, Unitec Business School, Auckland.
- Gatchalian, M. L. (2010) An In-depth Analysis of the Entrepreneurship Education in the Phillipines: An Initiative Towards the Development of a Framework for a Professional

- Teaching Competency Program for Entrepreneurship Edcuators, The International Journal of Research and Review, Vol 5, pp.51-73.
- GOK. (2000) The Commission of Inquiry into the Education System in Kenya, Government Printer, Nairobi.
- GOK. (2013) *Accredited Technical Institutions*, [Online] January 21st 2013. Available from http://www.scienceandtechnology.go.ke [Accessed 24th January, 2013].
 - Jones, C., & English, J. (2004) *A Contemporary Approach to Entrepreneurship Education*, Education and Training, Vol. 46, No8/9, pp. 416-423.
 - Maina, R. (2006, June Friday, 2nd) *Stimulating Youth Entrepreneurship in Kenya*, Structured Qualitative Methods EDMP 638 . Nairobi: (Unpublished).
 - Klyver, K., Hindle, K., & Meyer, M. (2007) *Influence of Social Network Structure on Entrepreneurship Participation A Study of 20 National Cultures*, International Entrepreneurship Management Journal, 4: 331-347.
 - Klyver, K., Hindle, K., & Schott, T. (2007) Who will be An Entrepreneur? How Cultural Mechnisms and Social Network Structure Together Influence Entrepreneurial Participation, Frontiers of Entrepreneurship Research, Vol. 27, Iss. 7, Article 1.
 - Kolb, D. A. (1984) Experiential Learning: Experience as the Sourse of Learning and Development, Prentice Hall, New Jersey.
- Luyima, J. (2010) *Implementation Strategies for Entrepreneurship Skills Education in Secondary Schools of Nangabo Sub-county, Uganda*, A Dissertation Submitted to the School of Postgraduate Studies of Makerere University as Fulfillment of a Course Requirements for the Award of Master of Education in Curriculum Studies, Makerere University.
 - Mansor, M., & Othman, N. (2011) CoBLAS: Inculcating Entrepreneurial Culture among Higher Education Institutions' Students, International Journal of Social Science and Humanity, Vol. 1, No. 1, 86-91.
 - Mwangi, S. (2011). The Contribution of Entrepreneurship Education Course in Enhancing Management Skills of Informal Entrepreneurs, Journal of Education and Vocational Research, 2 (3):86-92.
 - Nelson, R., & Johnson, S. (1997) Entrepreneurship Education as a Strategic Approach to Economic Growth in Kenya, Journal of Industrial Teacher Education, 35(1):7-21.
 - Nkirina, S. P. (2009) *The challenges of Integrating Entrepreneurship Education in the Vocational Training System*, Integrating Entrepreneurship Education, 34(2):153-166.
- Industry Canada (2010) The Teaching and Practice of Entrepreneurship within Canadian Higher Education Institutions, Industry Canada, Ottawa.
 - Pihie, Z. A., & Bagheri, A. (2011) Are teachers qualified to teach entrepreneurship? Analysis of entrepreneurial attitude and self-efficacy, Journal of Applied Sciences 11, 3308-3314.
 - Pittaway, L., & Edwards, C. (2012) Assessment: Examining Practice in Entrepreneurship Education, Education and Training, Vol. 54 No.8-9, pp. 778-800.
 - Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. (2004) *Networking and Innovation: a Systematic Review of the Evidence*, International Journal of Management Review, Vol 5/6, Issue 3/4, pp. 137-168.
 - Pittway, L., Rodriguez-Falcon, E., & Aiyegbayo, O. (2009) *The Role of Entrepreneurship Clubs and Societies in Entrepreneurial Learning*, Research in Entrepreneurship: Working Paper Series, Working Paper 01-2008.
- ROK. (2005) Sessional Paper No. 2 of 2005 on Development of Micro and Small Enterprises for Wealth and Employment Creation for Poverty Reduction, Government Printer, Nairobi.

- Santos, J. (1999) *Cronbach's Alpha: A Tool for Assessing the Reliability of Scales*, Extension Journal, Vol. 37 No. 2, pp. 1-5.
 - Sherman, P., Sebora, T., & Digman, L. (2008) Experiential Entrepreneurship in the Classroom: Effects of Teaching Methods on Entrepreneurial Career Choice Intentions, Journal of Entrepreneurship Education. Vol. 11, pp. 29-42.
 - Simiyu, J. (2010). *Entrepreneurship Education as a Tool to Support Self-employment in Kenya*, UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training, TVET Best Practice Clearing House, Issue 2, pp. 1-8.
 - Smith, A. M., & Paton, R. A. (2011) Delivering enterprise: A collaborative International Approach to the Development, Implementation and Assessment of Entrepreneurship, International Journal of Entrepreneurial Behaviour & Research, 17 (No. 1), 104-118.
- Thompson, P., Scott, J., & Gibson, D. (2009) Experiential Learning, New Venture Creation, Strategic Entrepreneurship, Knowledge and Competency in the University Context, Queen's University Management School Working Paper Series, Paper No. MS_WPS_MAN_09_11, Queen's University.
- Tranchet, N., Rienstra, D. (eds) (2009) Educating the Next Wave of Entrepreneurs: Unlocking Entrepreneurial Capabilities to Meet the Global Challenges of the 21st Century. A Report of the Global Education Initiative, World Economic Forum, Switzerland.
 - Warren, M. (2011) Econometric analysis of the impact of entrepreneurship on economic growth Case of the Kenyan economy, Journal of Economics and Sustainable Development, 2 (No. 7), pp.71-88.
- Wynd, C., Schmidt, B., Schaefer, M. (2003) *Two Quantitative Approaches for Estimating Content Validity*, Western Journal of Nursing Research, 25(5), 508-518

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